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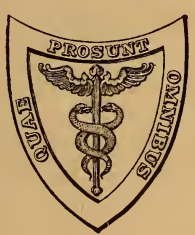

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The work as a whole needs no commendation. Many years ago it earned for itself the enviable reputation of the leading American work on surgery, and it is still capable of maintaining that standard. A considerable amount of new material has been introduced, and altogether the distinguished author has reason to be satisfied that he has placed the work fully abreast of the state of our knowledge.—*Medical Record*, November 18, 1882.

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AMERICAN JOURNAL

OF THE MEDICAL SCIENCES.

MAY, 1889.

TREATMENT OF POTT'S PARALYSIS BY SUSPENSION, ETC.

By S. Weir Mitchell, M.D.,
MEMBER OF THE NATIONAL ACADEMY OF SCIENCE.

I have seen in the last ten years many cases of paralysis, the secondary results of angular curvature of the spine, and twice I have met with these palsies where there was tenderness over two or more vertebræ and local elevation of temperature *without* any visible curvature or projection.

It is hardly necessary here to dwell upon the causes of these palsies. They are due to inflammatory thickening of the membranes, causing pressure, which leads to myelitis and local atrophic destruction in the areas so compressed.

More rarely—very rarely—the whole bony spinal structure is so damaged as through its collapse to lead to pinching of the cord. In either case there may be, finally, degenerative changes in the cord below the portion diseased by pressure. Owing to the fact that the front of the spine suffers most, motion is primarily impaired, and sensation slightly, or not at all, or only much later in the case. Excessive reflexes early announce the interruption of nerve paths and the presence of irritative changes, and only cease to exist if (as is usual) degenerative alterations affect the regions below the seat of carious disease. Finally, sloughs may occur, and death from exhaustion.

In other cases to be found in every abode of incurables, the palsy, in whatever degree it be present, is a thing for life, and by no means the finally curable matter which many assume it to be. The common his-

tory of mild cases is one of motor loss with only more or less numbness, and the usual excess of reflex activity.

For many years of my life, carried away by modern authority and example, I put all cases of Pott's paralysis at rest, used tonics and oil, and cauterized the back. In most instances this method answers. It is slow, but it suffices. The spinal curve left to itself solidifies—the palsy fades away. The treatment is wearisome and confining, but at last the patient gets up and puts on a brace.

After some years I met with two cases in succession which did not get well at all, and, about this time, I found one or two children who were sure to die of tubercle if left in bed. In despair I fell back upon the treatment by suspension advocated by my father, Prof. J. K. Mitchell, in 1826.[1]

As soon as I began again to use this simple means, I saw that it was admirably effective. It lets the patient get out of bed; it distinctly alters the pathological curve of the spine; it gives ease and relief to aches; it seems to act with more speed than other plans, and, when these have failed, it gives a new resource.

For the orthopædist of to-day the back is to be splinted. The conditions in Pott's disease are likened by him to those of a fracture; but if compared to any, it should be to one of the thigh where the muscles are continually pulling at the fragments. The problem is this: If we draw upon the bent spine of caries, so as slowly to alter its curve, will the gap we create be filled up by tissue firm enough for support? It seems to be so. So much for the mechanical part of the question. It is needless to go further as to a matter settled by numberless cases.

When, in addition, we come to ask how extension acts upon the spinal cord, and the inflammatory products which compress it, the question is more puzzling. Why is it that pulling at the curve, in some way before we much alter that curve mechanically, and often in a few days, so changes the conditions *within* the canal as to allow sensory impressions to pass the seat of stricture?

[1] Amer. Journ. Med. and Surg., Jan. 1826. Some of the earlier surgeons, as Glisson, used suspension from the head, even adding weights to the legs. Darwin, the author of "'Zoönomia" (1801, p. 140), proposed extension by crutch supporters set on the arms of a chair with *occasional* aid by suspension from the head. He seems to have preferred suspension in bed on an inclined plane. M. Le Vacher, whom he quotes, in 1768 used suspension by the head, the weight being borne from the hips. Shaw (London, 1827, p. 98) treated his cases by the inclined plane. The cut in which he figures a suspension by the head (p. 107) refers to the use of a jacket (p. 32) as a support for the head-stay. Bamfield also seems to have used suspension, or mere sustentation, kept up from a jacket supported on the pelvis. Sheldrake's curious book (1798, p. 20, *et seq.*) figures a pelvic support for a head-suspending iron. Most of the attempts to suspend either used a jacket as a point of support, or employed the inclined plane. No reasonable systematic suspension slowly increased, or combined with a chance to move about, preceded the date of my father's paper of January, 1826. Pott's papers bear the title of "Essays on Palsy of the Lower Limbs," and his account of this spastic paralysis has the distinctness of a master hand He speaks with some scorn of all machinery, and, as we all know, relied on issues, setons, and the like. Of late years Benjamin Lee, in an able paper, has recalled attention to the results and methods of J. K. Mitchell.

If the spinal cord, in place of hanging in normal suspension in the canal, is in these cases of caries bound fast and anchored, so to speak, it seems probable that any serious extensive force exerted on the angulated column of bones must more or less pull upon and disturb the binding masses of inflammatory deposit. I believe, however, that there is something more than this involved, and that the pull made on the whole length of the bony column, even when no meningeal inflammation is present, may, in some way, alteratively affect both cord and membranes through stretching of the cord and alteration of vascular conditions. With this idea I have twice used suspension in cases of spastic paralysis in which there was no caries. Both proved failures. Meanwhile, in Russia and France (if we may trust a statement in the *Progrès Médical* of January 19, 1889) this means has had a brilliant victory in a fair share of cases of posterior sclerosis. I am now experimenting with it in this disease. I have no intention of entering fully on the general question of the therapeutic management of spinal curves caused by disease. I believe that, with rare exceptions, all cases of deformity of spine from caries are best treated by early use of suspension, in conjunction with other means; but my present object is to show that Pott's palsy (as it was called) is also best dealt with by this plan.

As to the methods to be employed, something must be said. When in 1826 my father used suspension, he devised a number of ways of applying it so as to allow the child (for it was the young of whom chiefly he speaks) to sit up, to move in a spine-car on rollers, to ride a hobby-horse, or to sit in a swing. A curved iron, made movable and set by a screw, sustained the head-sling in which the head was held by the chin and occiput. His plan was cautious, and even deliberately slow, and as to it I leave the following quotation to speak:

"I have usually made very little extension for the first week; but have, thereafter, elevated the rod from one-eighth to one-fourth of an inch weekly, in proportion to the yielding of the spine. The progress of the reduction of the curve is, of course, more rapid at first; but as the curve is lessened, the mechanical advantage of the suspensory apparatus is equally diminished; and its effect is also resisted when that degree of curvature is removed which depended exclusively on causes having no relation to change of structure. But when a remnant of deformity is kept up by a change in the form of the vertebræ, and their *intermedium*, the operation of the remedies must be tedious as was the disease during its formation. When there is caries, we must wait for the production of new bone to support the wasted column; and when there is, without caries, a wedge-like condition of the vertebræ, we must rest on the slow, but certain, processes of absorption and deposition for a final cure. If undue pressure on one side of the column produces the deformity, the removal of the pressure to the other side must ultimately correct the distortion.

"For the fulfilment of the second indication nothing more seems necessary than to use the means suggested for the first. Cases *may* occur, of so violent and intractable nature as to demand continual support. Such must be kept, during the whole period of treatment, in one or other of the many instruments designed for the suspension of the head, and which at the same time interfere not with either general or partial exercise.

"It is not necessary to exceed four hours a day of suspension, but patients often like the application of extension to last longer, and they pass six hours or more in the head-slings."

All of the means alluded to I have employed, but in adults and in the wards of the Infirmary for Nervous Diseases, we make use in many cases of a cross-bar placed over a bed or a chair, and from this suspend the patient. A good plan for the chair suspension is to use a low seat on which are placed a dozen or less of thin one-eighth or one-quarter inch pieces of board. By removing one of these from time to time systematic extension is obtained.

My father usually proceeded, as has been seen, by cautious degrees. I, however, have been accustomed, especially in the young, or in young adults, to make at first a strong pull on the spine by suspension, and to leave the patient's sensations to govern the amount endurable. In younger people I follow my father's rule of very gradual increase in the amount of pull made by suspension. As it has become interesting to know how much pull on the bent spine is well borne, I have lately put a little steel spring balance in the suspension apparatus, with these results as to endurance. Many of these diseased people bear the pull of twenty to seventy pounds for four to six hours a day. The pain, the sense of gain, the fatigue, are good guides for us. A great variety of suspensory means may be used according to the site of the trouble, but it is so far clear to me that suspension by the head, partial or complete, aided or unaided, should be employed in every case where palsy is one of the results of the caries.

In cases of spinal maladies, to get the alterative of complete suspension, the plan of Matchoukowsky may be followed, or the plaster jacket used with or without additional pull on the head.

It is interesting to watch a case of Pott's palsy subjected to partial suspension treatment. The patient becomes more and more at ease, and, if in a wheel-chair, can move to and fro while suspended. In ordinary cases, where the vertebræ have not become reconsolidated in their new position, and where there is only a relative degree of motor palsy, the change, as I have said, is often so sudden as to excite surprise. In older or worse cases, where sensation has suffered, or where the third degree has arrived—that is, degenerative change below the curve—in all of these we must look for very slow gains, and welcome them first in the return of sensation, and then of the reflexes, from below upward.

Since writing this brief paper, I have read an editorial in *The Medical News* relative to Dr. Wood's method of making suspensions for the treatment of Pott's disease. It seems to me reasonable for cases of lower dorsal curvature alone, and I think it might be more so, if, while lifting from the jacket, a portion of the pull was made, also, directly through the head. I, myself, have never found anybody who would not bear

this partial suspension from the head alone and for hours. The pull it makes from the head is a very direct one upon the spinal column; the pull made by Dr. Wood's jacket must distribute itself over considerable space, and much of it must fail to influence the spine. Thus in his method the amount of pull which really acts on the spine is impossible to determine, and must depend to a considerable extent upon the situation of the carious vertebræ.

I shall certainly in the future suspend with both head and jacket in lower and in even mid-dorsal curves, and I am now using the jacket in a case of extension for ataxia. In cervical caries extension from the head is imperative. In old consolidated spines with palsy not due to bony pinching of the cord, I would use both means of suspension, and daily prolong the amount of this treatment. In very bad early cases with abscesses, I should desire to use extension, at first, by the milder method of the inclined plane. As to the medical treatment of Pott's disease, it is needless to speak; we all agree as to that; and, of course, in every case of palsy electricity should be used to keep up the muscular nutrition. This may be aided by passive motions and mild effleurage of the skin; and, later, by deep kneading, never to last very long. Neither does suspension exclude the use of frequent cauterization, for which Charcot claims so much. I may add that I have seen suspension succeed where frequent use of the hot iron had failed. It is interesting to find that my father, who had twice been in the East, recommends shampooing, percussion, and friction for the children under treatment. It remains to defend my position by relation of cases, and I shall as to this limit myself to the narration of three cases, but I shall also quote others from my father's essay.

This present paper does not pretend to bring forward any novelty; but, as I find neurologists all adhering to methods of treating the palsies of Pott's disease which appear to me ineffective or irrational, I have ventured to set forth anew a treatment which had so large a success in my father's hands, and has now again had it in mine.[1]

The following cases from his paper I quote, because his essay is not easily to be had, and because of the brilliant results he relates in cases of caries in various parts of the spine, and in instances of paraplegia following Pott's disease.

"I have seen no case of *posterior* curvature which did not cease to cause pain so soon as it was subjected to the action of the spine-cart. Irritation ceased, the tenderness of the part departed, and where the legs were affected they recovered their ordinary powers. In fine, to all appearances, there ensued a complete arrest of the diseased processes. The recent writers object decidedly to the use of suspension in carious cases, on the supposition that there exists considerable danger of fracturing the spine at the diseased part,

[1] Gowers speaks of suspension as possibly advisable, especially in children, where other means have failed, where it is said to have been followed by instant improvement. He gives no authority.

even after ankylosis has supervened. After the occurrence of ankylosis there can be no good reason for using my instruments, unless the disease should extend itself further.[1] Where there is advantage to be derived from extension, I would use them, without much regard to such theoretical objections, because the objectors are not able to produce a single instance of such an accident arising from mechanical extension.[2]

"To demonstrate more clearly the utility of the plan of treatment proposed in this paper, I beg leave to describe a few cases.

"On the 1st of February, 1842, I was invited by an eminent physician to see with him a case of curved spine. A. S., a boy, about five years of age, was the subject of this disease. At that time his occiput rested on the *vertebra prominens* so as to prevent any portion of the neck from being visible from behind. The pressure of the head upon the space between the shoulders had caused painful excoriations. In endeavoring to cleanse the back of the neck, it was necessary to insert a wetted cloth edgewise, as any attempt to introduce a finger gave considerable pain. Besides this posterior curvature which formed a very acute angle about the uppermost dorsal vertebra, there existed the serpentine or lateral curvature so well described by Dr. Shaw. This curvature was convex toward the right shoulder above, and convex toward the left hip below, a direction of lateral curvature from which it seldom, if ever, deviates. At the angle caused by the *posterior* curvature the patient felt, at times, severe pain, particularly when in motion. Indeed, so painful was a rotary motion, especially in bed, that he found it necessary to call for the assistance of an attendant when desirous of changing his position. During the greater part of the day he sought refuge from pain in bed, or in the arms of his mother or his nurse. His pulse was rapid, without force or regularity. Exacerbation of febrile symptoms in the afternoon, and colliquative sweats during the night, afforded proof of a hectic state of his system. His appetite was irregular, his tongue encrusted with a moist, russet-colored substance, and his breath very fetid. His bowels were usually costive, but sometimes relaxed. At times he complained of severe pain in the epigastric region. His skin was, during the day, dry and rough, and was covered with bran-like spots, as if the cuticle was separated from it in scales. For a few days before the consultation, the child had lost in great measure the power of deglutition. The water which he endeavored to swallow generally escaped from the angle of his mouth.

"The remedies used during the previous treatment of his case were, laxatives occasionally, and afterward the chalybeates, and some other tonic medicines. The child, before it became too feeble to endure exercise, had been directed to swing by grasping a suspended bar of wood and supporting its body by means of its hands and arms. The exercise was found to be too violent, and could not be endured long enough to produce beneficial results.

"In consultation, February 29th, we resolved to try the effect of such suspension as would relieve the patient of a portion of his weight, and at the same time permit him to take exercise.

"The mechanical deformity was treated by the chair with rockers and the spine-cart. After a short time the child refused to sit in the chair, but continued to use the cart four or five times a day. From the moment at which these means were applied there was exhibited a general amelioration of all these symptoms. The curve became less and less conspicuous—that which was lateral entirely disappeared—and there now remained of the angular projection only enough to show where the disease had been seated.

"On the 2d of June I deemed professional attendance no longer necessary, and to this day[3] the child remains robust, active, and cheerful, without deformity which would be observed by those who had not been acquainted with the previous history of the case.

[1] This is not the case however in curvature with paralysis. The curve may be old and unchangeable, but, nevertheless, the palsy will get well after use of suspension.—S. W. M.

[2] North American Medical and Surgical Journal, January, 1826, Dr. J. K. Mitchell

[3] He is still alive and well.—S. W. M.

"Several other cases resembling the above in the angular and lateral curve, the impaired digestion, and roughened skin, have been treated with equal success. One of them, the case of E. F., fell into my hands on the 4th of September of the present year. The patient is, at the date of this paper, December of the same year, in good health, and rather more than two inches taller, in consequence of this straightening of the curve.

"One of the most difficult and intractable cases I have yet encountered was that of E. C., a girl, four years old. This child had a posterior curvature, seated nearly in the middle of the back, and a serpentine curve so great as to cause the lower limbs to repose on the crest of the os ilii of the right side. The projection of the shoulder and hip was such as to excite the notice and sympathy of every one. The child remained about four hours a day in the spine-cart, and was left at liberty during the remainder of the time. At present the dorsal prominence is small and apparently diminishing; and although the child still exhibits some lateral curvature *when it is off its guard*, it is able to carry itself, when it chooses, nearly in an upright manner. While *in* the spine-cart no curvature of this kind is perceptible.

"James H., a boy, aged about seven years, was brought to me in May, 1824. He had evidently a disease of the middle dorsal vertebræ, by which the bodies of two, at least, of the bones appeared to be affected. A shuffling gait, observed about six weeks before, led to the examination of the case, and a physician at New Castle discovered the curvature. In this case one of our most eminent physicians advised issues; but as the mother was predetermined not to use that mode of treatment, the child was brought to me to be placed in a spine-cart. One was accordingly obtained, but was not used regularly, because of the unwillingness of the boy to submit to any restraint. The progress of the complaint was rapid, notwithstanding the use of purges, baths, etc. At length the lower limbs began to fail in their office, and the poor boy was compelled very frequently to throw himself, for ease, on his face on the floor. When he ascended the stairs he was obliged to go on all fours. At this time he expressed greater willingness to endure the restraints of a machine, because he found himself more comfortable when in one. In a few days, strength and facility of movement returned, and since that period no increase of curvature has been perceived. His general health is now good, and he has a remarkably robust appearance. It may, in this place, be proper to remark that in every case, except one, in which these machines have been applied, either to posterior or lateral curves, the tone and vigor of the system have been immediately restored, and the pain and tenderness of the part concerned have disappeared."

The following cases are my own.

One, as yet incomplete, is interesting for various reasons. I merely give, at present, a summary of its notable facts.

Mr. T., aged thirty-six years, angular curve in mid-dorsal region.

Two years ago he first noticed paralysis of motion, in March, 1888. Sensation suffered some months later in both hands, and had been entirely lost for five months in November, 1888. There was also complete loss of reflexes below the navel. There were, also, rectal feebleness and vesical palsy. There was erythema of nates, but no sloughs. He had been ably treated by the usual means—rest, cautery, etc. His general state was good. Suspension was used in December, and gradually increased to two or three to four hours a day, and the pull from twenty to sixty-five pounds. In two weeks there was partial return of sensation, which slowly improved. There was also return of clonus. In five weeks there was very slight return of the power to move the second and third toes of the left foot. Since then there is very slow increase

of sensation, which varies daily, as does the growing power to move the toes.

Of the future of this case I cannot speak confidently. It shows certainly the influence of extension on a spine already considerably consolidated, and I mention it here as being one of the worst I have ever tried to handle.

C. C., aged twelve years, of apparently healthy family, without tubercular history on either side.

In March, three years before I saw him, he began to complain of pain in his back, where, on examination over the middle dorsal region, there was found a slight projection. The parents of the boy being in the lower ranks of life, little attention was paid to his complaints, but, after six months, the curvature of the spine and the increasing amount of pain rendered it necessary for a physician to be seen. Under the advice of this gentleman, the child was given an ordinary spinal brace, which, however, did not appear to answer any better purpose than that of irritation. At this time there was more or less fever in the evenings, and a great deal of pain running round the flanks from the seat of the disease.

Late in the year there was more or less numbness in both extremities. In the fall the patient was placed in bed, where he remained all the winter; in fact, most of the time since, up to the date of my attendance—that is to say, for two and one-half years. During this long repose the curvature of the spine increased, the pain grew greater, and the limbs became numb. The patient was completely insensible to touch or to pain, and very soon after there arose, also, an increasing difficulty in motion.

When first I saw the lad, two years and a half from the period at which the disease began, this was his condition: The disease seemed to have followed the ordinary course of spinal-pressure paralysis: First, pain, loss of sensation in all of its kinds, then difficulty in motion, and, finally, loss of motility.

The reflex excitability went, however, far beyond the ordinary expression. A light blow with a percussion hammer on the shin caused the leg to fly up a foot or two from the bed. When six months later I saw him again, there was a marked degree of degenerative change in the muscles below the waist, and there was neither sensation, motion, nor reflexes. Water accumulated in the bladder, and had to be drawn off from time to time. The condition of the rectum was such that the feces had to be dug out, and the state of the child was most pitiable. The only thing which he lacked to complete the misery of this picture was the presence of sloughs, such as existed in one other case to which I shall call your attention.

So far as treatment is concerned, he had had cauterization, long rest in bed, with efforts to extend him while there, and a plaster jacket, which, so far as I could learn, had been very well put on. None of these means had done more than to make him comfortable by the relief from pain.

It was evident that in this case there had been pressure from hypertrophic thickening of the dura, since the curve was not sharp enough to have punched the cord. But, also, it was clear that there had been a degenerative change below the pressure point, because the reflexes had

entirely disappeared, and because the muscular responses to a blow were feeble or absent. Certainly, there was little to encourage treatment.

I directed the parents of this boy to have made a wooden support from which was hung a cord, to which was attached an iron arrangement according to the figures in my father's paper of 1826. It was found, after two or three days, when the child was sitting under this support with his head lifted and fully extended, that the pain did not trouble him, although he had never before been free from pain when sitting upright since he was attacked by the disease. This fact made him very willing to undergo the discipline necessary, and his parents were enabled in a few days to increase the amount of suspension to two hours morning and evening. No attempt was made to measure the suspensory pull, of which, however, I shall presently speak in regard to another case. The amount of lift exerted by this little apparatus was simply that which was comfortable, and never went so far as the whole weight of the body. The result was most striking. Within ten days after the suspension began there was a considerable return of active pain in the legs, together with the positive sense of touch over a large part of the limbs. Three days later he could tell which toe was touched, and he had generally good locality impressions as to touch within two or three inches of the place selected for trial. The pain sense came back nearly at the same time, and it then seemed to me to be extraordinarily acute.

At this period, also, there arose certain alterations in the nutritive state of the limb. This seemed decidedly apparent to his parents and friends. The skin became less dry. The brawn-like hardness which I had seen about his ankles passed away very rapidly, and the general rigidity of the muscles lessened. It was fully a month after the suspension began before he recovered any power over his bladder. The return of capacity to empty the rectum was much slower; it had to be stimulated by electrical treatment. Thirty or forty days after the suspension began, motion could be made in the right great toe; from this motility spread over the whole right limb and then began in the left.

It is hardly necessary to trace this case further; it is only needful to say that there was gradual return of all the functions, so that, at the end of four months, I was willing to permit the lad to get upon crutches and to wear a plaster jacket, but for fully eight months he passed a certain length of time in the suspensory chair, or in a spinal car, somewhat similar in appearance to the one described in my father's paper.

This lad made a fair recovery—that is to say, there is now no loss of sensation in the limbs—and he is able to walk about with the aid of a stick. He is capable of earning his own living.

A. B. C., a physician, aged thirty-two, and unmarried. He comes of a family noted for health and long life; free from scrofulous or tubercular disease, and without history of cancer nearer than four generations.

Previous to 1883 the patient's health was excellent. Aside from the slight ailments of childhood he had been perfectly healthy; never had venereal disease. In July, 1883, while playing football, he fell, striking hard upon the back, others falling upon him. Notwithstanding the severe concussion, he was able, in a few minutes, to walk home, and recovery from the immediate effects of the accident took place quickly.

An urgent country practice called this gentleman out upon long drives

over rough roads, and, after some weeks, pain was felt in the right flank. This was occasioned by severe exertion or sudden jolt. No attention was paid to this at first; but the pain increased in severity and constancy until November, 1883, when driving had to be given up. The pain was confined to the right side, and was not felt in the back. There was no prominence of any vertebræ; no weakness of the limbs. Meanwhile the general health was good.

The use of the actual cautery once a week, and small doses of iodide of potash, colchicum, and guaiacum gave no relief; on the contrary, the pain and soreness grew worse, extending to the back.

In January, 1884, weakness of the lower limbs was noticed. This came on when walking up hill or walking fast. The patient's legs began to twitch and jerk, and he had a tonic spasm of the muscles of the legs on awakening in the morning. The knee-jerk was exaggerated at this time and so remained.

In March, 1884, a prominence of one of the vertebræ was observed, and the diagnosis of Pott's disease was made. A plaster-of-Paris jacket, the actual cautery, the bichloride of mercury, iodides, and tincture of iron were used without avail, and in one month paraplegia was complete. Sensation was also abolished. The sphincters were powerless; the urine became alkaline and loaded with phosphates; priapism was present occasionally. The legs were jerked about in almost constant spasms. The feet, when at liberty, were drawn up to the body, and had to be tied fast to the bed. The legs were greatly wasted. Soreness in the back and sides continued to be severe, and for only a few minutes at a time could the patient sit up in bed.

One year later, in very much the same condition, but with sloughs of the nates, he came under my care at the Infirmary for Nervous Diseases.

The treatment adopted was at first the prone position and application of bags of ice to the spine. After ten days, hot water and ice were applied alternately to the spine four times daily for about half an hour each time. The bed-sores were treated with ice and hot water and easily healed. At the end of five weeks of this treatment the first changes were noticed. The spasms in the legs diminished somewhat. Sensation was still absent; but in the third week of treatment, at first touch, and then pain and temperature sense began to be slightly noticed in the legs above the ankles. The sensory changes were trivial, and, after five weeks in the infirmary without increase of betterment, the patient was sent home, and a plan of treatment adopted to which his cure is due.

Two weeks after his arrival at home (there having been no further change under ice and heat) a system of spinal extension was used. To the back of a wheel-chair was attached a steel shaft, curved so that it extended over the head. A head-piece, similar to that used in extending patients in applying plaster-jackets, was attached to this shaft. At first only a moderate pull was made, as it was somewhat uncomfortable, causing slight pain at the curve of the back and sides, and in the neck. But the patient soon became used to it, and was finally, at times, suspended by the whole weight of the body—120 pounds. No injury was done by this.

The back of the chair in which the patient sat was elevated many times a day, so that he was in a sitting position with a steady extension of the spine. Care was always taken that the back of the chair was lowered to a reclining position before the head-piece was taken off. On

going back to bed the head-piece was attached to a pully over the bed, and thorough extension was used before lying down.

Hot water and ice were used every day, and faradic electricity to the paralyzed muscles. Improvement came by degrees and sensation improved continuously. In three months the patient could move one toe a very little; in a few months he could stand, and in a year he could walk about. As motion improved, power over the sphincter returned to full strength. Sexual power had been lost, but now was restored. As motor gain took place sensation also improved, and is now normal. The muscular spasms which had characterized the case gradually lessened, and their lessening gave some of the first gleams of hope in this dark experience.

The patient writes that he is still gaining strength and gradually resuming his accustomed work. Suspension has been given up by degrees; but still, if the back aches after being long afoot, he uses suspension for a little while as a relief. A spinal brace put on nearly a year ago, is still worn for ease and support.

The curve at the seat of the disease in the spinal column is considerably less than it was to begin with; the knee-jerk is still excessive—six and a half inches of foot leap, and there is slight ankle-clonus, equal on both sides. However, as the man can walk several miles, is practising his profession without pain, with all his bodily functions restored, I look upon his cure as one of the greatest triumphs it has been my fortune to witness.

My conclusions are that suspension should be used early in Pott's disease.

That used with care, it enables us slowly to lessen the curve.

That in these cases there must be in some form a replacement of the crumbled tissues.

That unless there is great loss of power, the use of the spine-car or chair, etc., of John K. Mitchell, enables suspension, especially in children, to be combined with some exercise.

That no case of Pott's paralysis ought to be considered desperate without its trial.

That suspension has succeeded after failures of other accepted methods.

That the pull probably acts more or less directly on the cord itself, *and that the gain is not explicable merely by obvious effects on the angular bony curve.*

That the now well-known influence of extension in Pott's palsy makes it probable that in other forms of spinal disease, not due to caries, extension in various forms may be of value, as has apparently been of late made clear.

That the methods of extension to be used in these and in carious cases may be very various, only provided we get active extension.

That the plan and the length of time of extension must be made to conform to the needs, endurance, and sensation of the individual cases.

ON THE ETIOLOGY OF DIPHTHERIA.

An Experimental Study.

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Part II.

Sixteen of the 24 cases of diphtheria which we have studied, both morphologically and by the culture methods, Nos. I. to XVI., inclusive, occurred in a large foundling asylum with many inmates, in which the mortality each year, especially in winter, is large—particularly so during the prevalence of measles and scarlatina; 5 of these cases, Nos. XVII. to XXI., were from another large children's asylum in another part of the city, in which, also, during the winter season, the mortality from diphtheria is usually large; 1 case, No. XXII., was from a smaller children's asylum, in still another part of the city, in which diphtheria is of occasional occurrence; 2 cases, Nos. XXIII. and XXIV., were from private practice in an adjoining town. Nine of the cases were simple diphtheria, uncomplicated by any notable previous disorder; in 4 the local diphtheritic inflammation was preceded by a phlegmonous, suppurative, or erysipelatous inflammation in distant parts of the body; in 3 the diphtheritic inflammation was immediately preceded by well-marked scarlatina; in 7, by measles; in 1 by whooping-cough.

The only species of bacteria present in nearly all the cases (in all but two) in the pseudo-membrane was the *streptococcus*. This species was present in most of the cases in enormous numbers as shown by the cultures. In one case in which actual counts were made, it was found that from the invisible amount of material which clung to the tip of a fine sterilized platinum needle plunged into the softening pseudo-membrane from a bronchus, 124,300 colonies developed on the plates.

Cultures from the kidney, spleen, and liver were unfortunately not made except in some of the later cases; the results of these were as follows:[1] Kidney cultures in 3 cases; streptococci in pure culture in moderate numbers in 2 of them. Spleen cultures in 3 cases; streptococci in moderate or large numbers in 2 of them. Liver cultures in 3 cases; streptococci in moderate numbers in 1 of them. The streptococci were the only organisms found in these visceral cultures except in 1 case in which a few staphylococci aureus developed from the liver.

[1] The bacteria found in the lungs in these cases will be described later in connection with studies not yet completed by Dr. W. P. Northrup and the writer on the etiology of broncho-pneumonia of children.

The streptococcus was in all of the cases not only by far the most abundant form of bacteria in the pseudo-membrane, as judged both by cultures and microscopical examination of stained specimens, but it was the only form which appeared to penetrate the underlying tissues. While the streptococcus was most abundant in the pseudo-membrane and in the underlying necrotic tissue—and in these situations it was often present in enormous numbers—it was also found, usually scattered singly or in large and smaller masses, in the ducts of the mucous glands and in the lymph spaces of the submucosa. It was rarely found in the tracheal and bronchial lymph glands, and then only in the form of scattered single cocci or short chains. In the kidney, liver, and spleen I have never found the bacteria by staining even in those cases in which the culture method showed that it was present in small numbers. As judged by the culture method, the number of streptococci which these viscera contain is in nowise to be compared to the numbers present in the pseudo-membrane and underlying tissue. In the tonsil crypts, on the other hand, the number of streptococci found, both by the staining and by the culture methods, was often very large indeed.

The second most common form of bacteria in these cases was the staphylococcus pyogenes aureus or albus. While this species appears in cultures from the membranes in a large proportion of the cases, neither in numbers nor situation does it appear to bear any relationship to the extent or character of the pseudo-membrane. It was usually quite as abundant in the mouth or in the bronchial secretions as on the pseudo-membranes. It was more apt to be abundant when the membranes were softening, and in general its abundance seemed to bear a much closer relationship to the amount of catarrhal than of pseudo-membranous inflammation.

So far as the other species of bacteria are concerned, which were cultivated from these cases of diphtheria, some twenty different species were isolated, but they were either forms which control-examinations showed to be frequently present in the mouths or air-passages of healthy children, or were scattering forms occurring in greater or less numbers but with no uniformity.[1] The bacillus of Loeffler was not found in any of the cases.

In judging of the probable importance of the staphylococcus pyogenes aureus and albus which was so frequently present, although often in relatively small numbers, in our cases of diphtheria, it should be borne

[1] Two of the more common species occurring in the mouths of healthy children develop on agar plates in forms very closely resembling those of the streptococcus colonies in their early growth. These are, however, both short, stout bacilli, but the fact that when they first commence to grow they form delicate translucent dew-drop-like colonies quite similar to the streptococcus colonies might lead the inexperienced observer into error. In one of these forms, moreover, the short bacilli are apt to occur in chains which form a looped border to the colonies, closely simulating the beaded chains which fringe the edges of the streptococcus colonies in some stages of their growth on the agar plates. These I have called the "chain bacilli" of the mouth.

in mind that a long line of researches by a variety of observers has shown by actual cultivation that the staphylococcus pyogenes is very frequently to be found floating with the dust in the wards and operating-rooms of hospitals, and in many other places which are either overcrowded or filthy. It has, furthermore, been shown by repeated culture experiments that the staphylococcus pyogenes is a not infrequent inhabitant of the mouth and nose in health and disease. It has been found by Dr. T. M. Cheeseman in the dust of the operating-room in one of the large hospitals of this city. I have repeatedly found it floating in the dust of the rooms from which many of the cases above recorded of diphtheria were taken, and it has been found in some of the other rooms in the same hospital. I have cultivated it from the mouths of several children in the asylum from which most of our cases of diphtheria came who were apparently healthy, from the saliva in one case of whooping-cough, and in several cases of measles. I have found it in the mouths and throats of children and adults both well and ill in private houses and in our large city dispensaries. Finally, as stated above, the staphylococcus appears to bear no relationship whatsoever either in situation or numbers to the pseudo-membrane in the cases of diphtheria in which it was present. It would thus appear that from what we know of the biology and distribution of the staphylococcus, its occurrence in and about the membranes in so many of our cases of diphtheria cannot be regarded as of any especial significance so far as the etiology of the disease is concerned. It may act as a complicating factor in the disease—indeed, its well-known pathogenic properties would lead us to conjecture that it does—but this is at present the utmost significance which the facts will warrant us in attributing to it.

We are thus narrowed down in the analysis of the results of these examinations to the only species of bacteria which was present in nearly all of the twenty-four cases of diphtheria studied, namely, the streptococcus. To this species, then, we must now turn our attention.

The morphological and biological characters of the streptococcus found in these cases were fully worked out in each, and they were found exactly to coincide. The following characters, therefore, describe the species common to all the cases of diphtheria studied, and this species may be called, at least provisionally, *streptococcus diphtheriæ*.

Streptococcus Diphtheriæ.

Morphology.—Sphero-bacteria, or cocci, varying in diameter from 0.75 μ to 1.2 μ, average about 1 μ. When growing freely on quite moist surfaces, or in fluid culture-media, such as beef-tea, they are apt to form longer or shorter chains. There is a marked disposition in the cocci which form the chains to be closely united in pairs, and thus appear as diplococci when the chains are forcibly torn apart (see Fig. 1, Plate II.). As the cultures grow older individual cocci in the chains are apt to grow

larger and more irregular in shape, apparently through involution changes. In rapidly growing cultures the individuals composing the chains appear not infrequently a little elongated in the stage preceding division, and a little flattened transversely to the axis of the chain when the division is just completed.

Biology.—These bacteria do not fluidify gelatine. The colonies are white to the naked eye when they have reached a considerable size, and under the microscope have a faint yellowish or brownish shimmer. They are immobile; their growth is in general slow, but is hastened at the temperature of 37° C. (98.6° F.). No spores are formed. Growth occurs both at the surface and in the depth of the culture-media.

Gelatine plates. On the second day, minute, sharp-edged, coarsely granular dark colonies appear, and become very gradually larger. As they grow older the colonies in the depth of the gelatine frequently become rough and irregular at the edges. They spread slightly on the surface of the gelatine, forming rough, often looped-edged, very slightly elevated disks.

Agar plates (surface plants). At 37° C., after twenty-four hours, minute, translucent, colorless, dew-like colonies appear, which, as seen under the microscope, have even or irregular edges, a moderately finely granular surface, and a faint yellowish shimmer. As the colonies become older (two to five days) their surfaces, particularly if the agar becomes a little dry, are apt to appear more coarsely granular. The outline of the slowly spreading colonies, as the growth gets older, is apt to become more or less irregular, from the projection of loops and strings of cocci, which, if the culture surface remains moist, may form a slowly spreading delicate pellicle of variously curved and contorted chains (see Fig. 2, Plate II.). Not infrequently the older colonies are more or less zonulated from successive rings of peripheral growth.

Agar-glycerine plates (glycerine 5 to 10 per cent.). The growth is essentially the same as in simple agar.

Blood-serum plates. The growth is much the same as on agar.

In *Beef-tea*, at 37° C., the growth is moderately vigorous, forming in twenty-four to forty-eight hours a considerable number of delicate white flocculi, which gradually collect along the sides or at the bottom of the tube. Growth at air temperature similar but slower.

In *Gelatine Tubes* the growth appears, at the temperature of the room, in from twenty-four to forty-eight hours, as a delicate, white, exceedingly finely beaded streak along the puncture-line, and is scarcely visible on the surface. After several days the central portion of the puncture streak becomes dense and whitish, and is beset on all sides with more or less discrete, whitish, spheroidal colonies, which may become as large as one millimetre in diameter. At this time the surface growth may be

scarcely perceptible, or may have spread a little as a delicate translucent pellicle. The gelatine is never fluidified.

In *Agar Tubes* the growth along the puncture-line is apt to be more even and continuous than in gelatine, and is never extensive, while on the surface it appears as a faint translucent sinuous-edged pellicle, rarely spreading more than 1 to 3 millimetres from the point of inoculation.

In *Blood-serum* tubes the growth is essentially the same as on agar, but a little more vigorous.

On *Potato* there is no visible growth, but there appears to be sometimes a very slight proliferation near the line of inoculation.

The streptococcus diphtheriæ is readily stained by the common aniline dyes, and both from the cultures and in the tissues retains the color when treated by Gram's method.

Pathogenesis.—The experiments upon animals were made with cultures from ten of the cases of diphtheria—Nos. III., VI., VIII., XIII., XV., XVI., XVII., XVIII., XIX., XXIV. These were cases selected at random from the different hospitals or houses from which most of the material was derived. Vigorously growing beef-tea cultures were, for the most part, employed from two to five days old. Such cultures are slightly turbid when shaken to break up the flocculent growth, and quantities varying from five drops to two cubic centimetres were used for each inoculation. The inoculations were performed with the usual precautions against accidental contamination. The very convenient Sternberg sterilizing injecting syringe was for the most part used. It does not seem to me necessary to give in detail a history of each of the inoculated animals, since the general results, so far as our subject is concerned, are the ends sought for.

Altogether, 80 animals—rabbits, hens, and pigeons—were inoculated with the streptococcus. The following is a summary of the results:

Hens. In hens (8 animals), the subcutaneous inoculation and the inoculation into the scraped or punctured mucous membrane of the mouth or trachea were entirely without result, save for a temporary redness of the mucous membranes following the local mechanical injury. Subcutaneous inoculation gave no results.

Rabbits. Intravenous injections (9 animals). The injection of from ½ to 1½ c. c. of beef-tea culture was made, with no marked effect in any case.

Subcutaneous and *intramuscular* injection (10 animals). These inoculations were made in the pectoral or thigh muscles, or beneath the skin in these regions. In 7 of the cases, there was a considerable formation of pus at the seat of inoculation, usually in the form of a small, circumscribed abscess. The streptococci were readily cultivated from these abscesses, unless they had become old and the pus quite dry and grumous, when

they were found in very small numbers, or not at all. In 3 out of the 10 cases, the result was negative.

Injection into the subcutaneous tissue of the ear of the rabbit (24 animals). In 1, there was no effect whatsoever. In 4, there was a slight, diffuse redness about the seat of inoculation, passing away on the second or third day. In 5, there was slight local redness, on the second day passing off, and the formation of a small subcutaneous abscess from the third to the eighth day. In 2, there was moderate local redness, followed by death, under symptoms of progressive weakness, on the second and fourth days. In 12 cases, there was well-marked erysipelatous redness of the ear, extending, sometimes, for an inch about the seat of inoculation, but most often involving the whole ear, and extending down into the head. The redness and circumscribed thickening of the ear in these cases were usually sharply defined and slowly progressive, as in typical erysipelas. The inflammation was established on the second or third day, accompanied by a rise of temperature of from 1° to 3° C. (32.8° to 37.4° F.). Resolution usually began on the fourth day. In 7 cases, resolution was complete; in 3, a small abscess formed at the seat of inoculation; in 2 cases death occurred, and in the second on the fourth day. No internal lesions were ever found in these cases of erysipelatous inflammation of the ear, nor was there, except in the fatal cases, much evidence of systemic disturbance. Streptococci were cultivated from the fluid exudation at the seat of the inoculation. The erysipelatous inflammation was more marked and intense if the tissue of the ear was pierced or undermined in various directions by a sharp, sterilized needle before the bacteria were introduced, by the method of Biondi (12).

Injection into the anterior chamber of the eye (6 animals). A moderate conjunctivitis occurred in 2 cases, with opacity of the cornea about the puncture, and a moderate accumulation of fibrin and pus in the anterior chamber. All of these evidences of inflammation began to subside on the fourth day, and within two weeks the exudation had largely disappeared. In 4 of the cases, an intense panophthalmitis occurred, with destruction of the eye.

Inoculations into the mucous membranes (6 animals). These were accomplished, in 3 animals, in the trachea by tracheotomy, the mucous membrane being scraped, and the culture rubbed into the abraded surface; in 2 animals, in the mucous membrane beneath the tongue; and in 1 animal, in the vaginal mucous membrane. In none of the animals was there any marked reaction, either local or general.

Pigeons. The inoculations in these animals (17 in number) were made on the mucous membrane of the mouth beneath the tongue, or in the larynx[1] and upper end of the trachea. The operation consisted either

[1] Owing to the conformation of the pigeon's throat, and the great mobility of the larynx, the upper end of the trachea is readily accessible through the mouth.

in scarifying the mucous membrane with a sterilized scalpel or needle, and then firmly rubbing in the culture; or in making a submucous injection of a few drops of the same.

The general effects may be briefly summarized: In 2 animals, there was no effect whatsoever, either local or general. In nearly all of the cases there were moderate redness and swelling about the seat of inoculation, on the second day. This, in 4 cases, was accompanied by a yellowish-white pellicle from 0.5 to 1 mm. in thickness, which did not spread, and consisted of necrotic mucous membrane containing micrococci similar to those injected. In 3 of the cases of tracheal inoculation, in addition to dusky redness and swelling of the mucous membrane, there was a white, dense, stringy, moderately firmly coherent pellicle, over the affected surfaces. This in no case tended to spread, and consisted largely of mucus. About one-half of the animals died, from the second to the sixth day, without dyspnœa or symptoms other than those of progressive feebleness. Of the animals which showed a moderate degree of local and inflammatory reaction, 2 were sick for three or four days, and then completely recovered, while 3 were apparently not sick at all.

We thus find that the reaction of animals to the inoculation of the streptococcus diphtheriæ varies a good deal with the species of animal experimented upon. While chickens are, in general, invulnerable, rabbits and pigeons show a marked, though varying, degree of susceptibility. In general, it may be said that young animals are markedly more susceptible to its action than old ones. The general effect is to produce either suppuration or erysipelas, or local necrosis or septicæmia, without marked lesions. Sometimes, one or more of these general effects are associated as the result of the same inoculation.

It is thus evident that the streptococcus diphtheriæ, as cultivated from our group of cases of diphtheria, though not inducing in the animal experiments which I have done a disease which can be regarded as diphtheria, is yet, in some animals, markedly pathogenic.

Control Cases.

For the purpose of control, I have made cultures from the scrapings of the throat and especially the tonsils of twenty-five healthy children, living in private houses or in a new and well-aired maternity hospital, and in these I have not found a single colony of the streptococcus.

I further made cultures from the throat and tonsil scrapings of six cases in private practice during illness—two of measles, two of scarlatina, one of follicular tonsillitis, and one of quinsy. In two out of these six cases, large numbers of streptococci identical in every respect with those isolated from our cases of diphtheria were found in enormous numbers. Their effects were tested on animals. The other four cases gave no streptococci. The two cases in which the streptococci were found were

the cases of scarlatina occurring in the same house. This is especially noteworthy, as, within one week of the time of the examination, diphtheria of a severe form developed in both of the children; going on, however, to final recovery, so that no further examinations were made. Thus, out of thirty-one control cases, the streptococcus was found in only two, and these were cases of scarlatina in private practice which shortly developed diphtheria.

Conclusions from Experiments.

We are now ready to see what conclusions can be justly drawn from these researches as to the etiology of the cases of diphtheria which we have studied in detail. It is a well-known principle founded upon the modern methods of research, that in the investigation of the etiology of any acute infectious disease we should seek to ascertain first whether there are special forms of bacteria present in the lesions with such uniformity as to justify the conjecture that they may stand in an etiological relation to it. The answer to this question we have found in our cases of diphtheria in the nearly uniform presence in significant situations of a streptococcus. Second, we should seek to isolate in pure forms and to learn by cultivation under varying conditions the life-history of the suspected organism. This has been done in detail in every one of the cases of diphtheria examined. Third, we should, by inoculations of the pure cultures of the suspected organisms into animals, learn whether they are capable of producing disease or not, and especially should we endeavor to induce a form of disease similar to that from whose lesions the organisms were derived. We have found in pursuing the third line of inquiry that, while the suspected bacteria were markedly pathogenic, we have not been able to induce, by their inoculation in animals, a disease which can fairly be regarded as diphtheria.

Let us now see whether the failure to induce diphtheria in animals really means that the streptococcus which we find under such suspicious conditions in the human disease is really of no significance as an etiological factor. In the first place, it is very doubtful whether any of our domestic animals, or any of those which are commonly employed for experimental purposes, are ever spontaneously subject to diphtheria as we know it in man. There is, indeed, a disease common enough in calves, in fowls, in pigeons, and in rabbits, in some parts of the world, which is called diphtheria, and which is associated with the development of a false membrane on the mucous surfaces; but, so far as these have been investigated by the modern methods, it appears that in none of these are the same bacteria found as are present in the human disease; and, moreover, the species of bacteria which are found, and which are presumedly the cause of the disease in animals, differ entirely in the different animals.

Moreover, although there is a considerable number of fairly well

authenticated instances in which the animal diseases from one species or another have been communicated to man with the development of the general symptoms of diphtheria, and a fairly typical local lesion, it may well be questioned whether there is anything more than a general analogy between this disease and genuine human diphtheria; for, after all, as we have seen above, it is the etiological factor which we must ultimately depend upon for the identification of the disease. On the other hand, although many hundreds, perhaps thousands, of attempts have been made to reproduce the human disease in animals by inoculation either of the fresh membranes or cultures, more or less pure, of various microörganisms isolated from them, there does not appear to have been a single case in which an effect was induced which could fairly be absolutely identified with the human disease. We are thus very unwillingly led to face the possibility that animals are not subject artificially, as they appear not to be naturally, to diphtheria as we know it in man.

Now in a disease which is accompanied with a definite and constant lesion, such, for example, as tuberculosis, the problem of the significance of the results of inoculations in animals is much more simple. But in diphtheria, as in typhoid fever and some other diseases whose local lesions are variable and may be absent altogether, we must recognize the possibility that after all we may be forced, by the nature of the case, to do without the light which successful animal inoculations might throw upon the problem of their etiology. In other words, there is a growing probability that there may be acute infectious diseases to which animals are neither naturally nor experimentally subject. If such should prove to be the case, we may find ourselves perforce obliged to rely upon the evidence which the constant occurrence of a definite species of bacteria in a given disease in a large number of cases can furnish, and upon the side light which can be thrown upon the problem by a variety of collateral experimental and clinical observations.

I would not be understood to say definitely that diphtheria, or any other acute infectious disease, cannot be produced artificially in animals. I wish only to call attention to the fact that, so far as the evidence goes, genuine diphtheria as we know it in man has not, in my opinion, up to the present time been thus induced.

Now, we have found in all but two of the twenty-four cases of diphtheria examined a distinctly pathogenic species of bacteria with great uniformity, a species of bacteria which does not, indeed, induce diphtheria in the animals experimented upon, but does induce allied forms of inflammation. Moreover, we have not found in any of the cases the bacilli of Klebs–Loeffler, nor any other to which any significance can justly be attributed.

It may, of course, be said that these streptococci may not actually be the cause of the disease, though so constantly present; that the disease

may be induced by some other unknown agency, some germ, perhaps, which does not grow under the artificial conditions which we supply; and that it is simply the furnishing by the lesion of a favorable growth-medium for the streptococcus which may explain its common occurrence. That all this may be true must be admitted; that it is so it needs facts as yet undiscovered, and to which there is no clew, to make probable. On the whole, it seems to me that, considering the insusceptibility of animals to diphtheria as we know it in man, the result of all of these series of experiments taken together abundantly justifies us in the assumption that in a certain class of cases, at least, diphtheria is caused by a streptococcus having the characters set forth above.

Remarks on Various Features of the Cases of Diphtheria.

As to an explanation of the apparent absence of the streptococcus in two of the cases studied—Nos. XVI. and XXIII.—I have none to offer. It is, of course, possible that they may have been at some time present and died out, but I have found them in the greatest abundance in cases of equal or greater duration of the disease. It is quite possible that by some technical inadvertence I may have failed to find them, although these cases were studied with the same detail and care as were the others. It is, furthermore, possible that, although called diphtheria, in accordance with the views laid down early in this paper, these apparently exceptional cases may have been examples of simple pseudo-membranous laryngitis or croup. Indeed, Case No. XXIII. was diagnosticated as "croup" by the attending physician, with the distinct specification that there was no clinical evidence of "diphtheria" in the case. The child died from strangulation, the parents having refused operation. But within a few days, in the same house and family, another child was similarly attacked, but with symptoms of marked constitutional disturbance, and shortly died. In this second child (Case XXIV.) the streptococci were found not only in the membrane, but in small numbers in the viscera.

It will be remarked, in the cases of diphtheria in which cultures were made, not only from the local lesions, but from the kidney, liver, and spleen, that, while the streptococci were usually present in the pseudo-membranes and in the tissues just beneath it in very large numbers, they were, when found in the viscera at all, only present in very small numbers indeed. They were also usually absent, or present only in very small numbers, in the tracheal and bronchial glands, although these are apt to be red and swollen and their lymph sinuses to contain fibrin. This condition of affairs, taken together with the early and severe symptoms of systemic infection and the lesions of parenchymatous degeneration of the viscera, especially the kidneys, which are apt to occur in diphtheria, would seem to indicate that the systemic changes are probably due to the

absorption of some soluble poison (ptomaine) produced where the streptococci are most actively growing, namely, at the seat of local lesion, or possibly, as will be seen later, in the lungs.

Metastatic septic visceral inflammations were present in none of the cases examined, and are, as is well known, not very common in diphtheria.

In nearly all of the cases of diphtheria in our series the pseudo-membrane was moderately developed or very abundant. In two, however, complicating measles, Nos. XX. and XXI., death occurred so early that in one case there was no pseudo-membrane found, and in the other but two small, isolated fragments.[1]

The detailed study of these early fatal cases, both morphologically and by the culture methods which served to identify the species of bacteria present, throw, as it seems to me, a good deal of light upon the manner of local invasion of the disease.

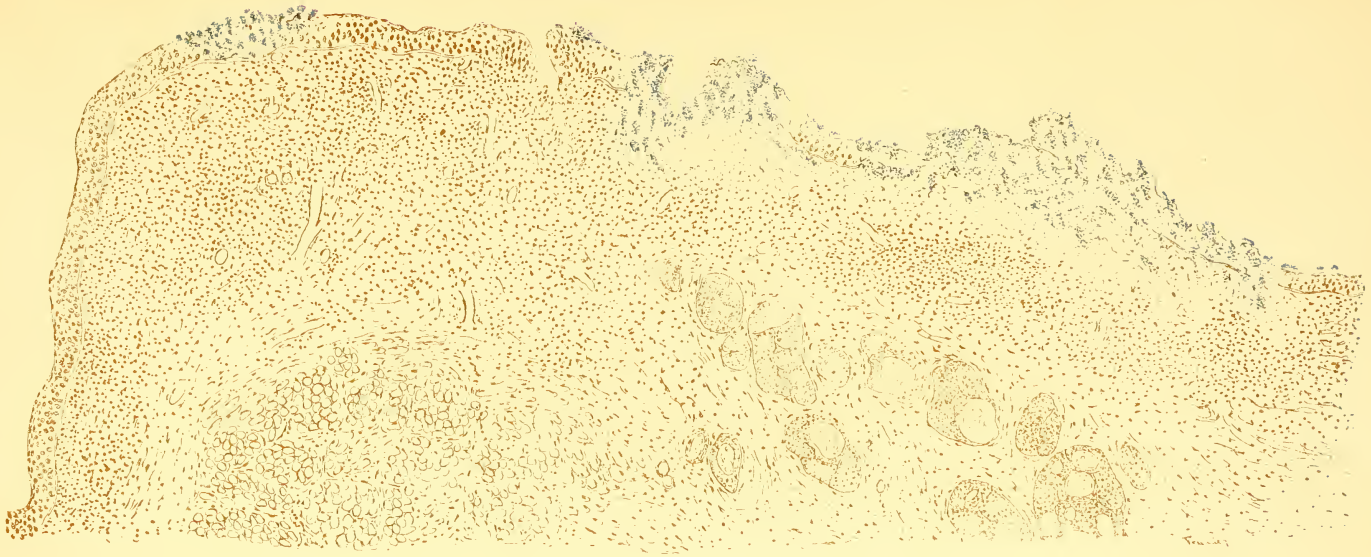
In the case (No. XX.) in which no pseudo-membrane had formed there were the lesions of an intense catarrhal pharyngitis and laryngitis. The bloodvessels were congested, there was an increased amount of mucus on the surface, and the epithelium was in places loosened and proliferating. It was found, both by the microscopical examination and by cultures, that streptococci were scattered sparsely over these inflamed surfaces. In two situations, however, the streptococci were found in considerable masses, namely, in one of the tonsillar crypts and in the ventricle of the larynx. In the tonsil crypts, distinct though small areas of necrosis of the epithelium were found in the immediate vicinity of the bacterial masses. In the ventricle of the larynx no evidence of necrosis was found, but the epithelium was in places detached, and streptococci were found beneath and between them, and in small numbers in the adjacent submucosa.

In Case XXI., on either side of the base of the epiglottis in the pharynx were small white patches, which had the gross appearance of pseudo-membrane. The microscopical examination showed that in these situations there was a considerable heaping up and detachment of the epithelium, with partial necrosis of the cells and of the submucosa beneath, while streptococci and single cocci were scattered and massed among the cells and in the necrotic tissue beneath them. In the same case the small pseudo-membranous patches just below the rima glottidis showed necrosis and partial detachment of the epithelium, which, mingled with granular material and large number of cocci, singly, in pairs, and in chains, formed a well-defined, irregular pellicle. The submucous tissue beneath this pellicle was superficially infiltrated with similar bacteria, and was necrotic (see Plate IV.).

The abdominal viscera in these two cases were not sent to me, so that no bacterial examination was made of them, and so slight were the local

[1] These two cases belonged in a group of five cases of measles with diphtheria sick at about the same time and in the same place. In two of these voluminous pseudo-membranes formed, the duration of the diphtheritic symptoms being longer than in the non-membranous cases, in which death occurred almost at the outset of the disease These facts, together with the results of the bacterial examinations, seem to justify the diagnosis of diphtheria.

PLATE IV.



Longitudinal section of larynx, just below *rima glottidis,* in diphtheria (Case XXI.) showing the commencement of the formation of a pseudo-membrane, and the infiltration of the involved tissues with streptococcus masses.

lesions that it would seem at first as if we were hardly justified in assuming that death was due to diphtheria unless there had been a systemic infection from some source other than the pharynx and larynx. In Case XX., however, although there was but a very slight amount of broncho-pneumonia, the air spaces of the lungs contained enormous numbers of cocci and streptococci. It is quite possible—and Dr. Northrup and I have already made numerous observations which speak strongly in favor of the view—that in cases like these the early death in diphtheria may be due to the absorption from the lungs of a bacterial poison before either a pneumonia has developed or a pseudo-membrane formed.

I have been much impressed in the course of these studies with the disproportion which often exists between the amount and the extent of the pseudo-membrane, particularly of the larynx and trachea, and the actual involvement of the underlying mucous membrane. There are, I think, always to be found some regions where the pseudo-membrane is closely attached to and is formed in part by the epithelium and the superficial layers of the submucosa; but in almost all cases the pseudo-membrane spreads away over areas of mucosa where the epithelium is quite intact, and its underlying tissue, save, perhaps, for congestion and œdema, is perfectly unchanged. Very often I have found a closely adherent pseudo-membrane extending from the tip of the epiglottis down over the vocal cords, or simply about the cords themselves, which was made up in large part of the superficial layers of the mucosa; while below the vocal cords a more voluminous and largely fibrinous false membrane extending through the trachea and even into the small bronchi left the mucous membranes of these tubes virtually intact. It would seem that a comparatively small area of actual involvement of the mucous membrane can, in the larynx and trachea at least, furnish the material for a fibrinous pellicle of great extent. In the pharynx, however, the extent of the pseudo-membrane is much more nearly coincident, in my experience, with the involvement of the mucous membrane, than in the larynx and trachea. This condition may serve, partly at least, to account for the disproportion which is so often observed between the apparent extent of the local lesions and the systemic infection, and may in part explain the absence of the symptoms of general infection in some cases which, on clinical grounds, has appeared for so long to justify the separation of croupous laryngitis from diphtheria.

Examinations of Children Exposed to Diphtheria.

As we are not able to confirm by the successful induction of typical diphtheria in animals, the conclusions to which we are led by our morphological and biological studies on diphtheria, it seems highly important to draw all the data possible from a careful study of the conditions under which children are placed in hospitals or elsewhere where diphtheria is

prevalent among them, since valuable evidence, confirmatory or otherwise, might, it seems, be arrived at in this way. With this end in view, I have made a series of studies on children not the victims of the disease, but associated with those who were suffering from it in the hospital in which it was frequently occurring and from which most of our cases were taken.

In the first place, with the concurrence of Dr. Northrup, I examined, by the culture methods, scrapings from the tonsils of 25 children both well and ill. In 17 of these cases no streptococci were found. In 8 of the cases the streptococci were found in small numbers. All of these 8 positive cases had been for some time in the hospital and in rooms in which diphtheria was liable to occur. One of these cases in which the streptococcus was found had been in the room with the mother, who was the victim of puerperal fever. This child died soon afterward from a severe umbilical phlegmon, and from the inflamed tissues large numbers of similar streptococci were cultivated. Two of the cases were suffering from measles. They were quarantined at about the time the examinations were made, and soon after developed diphtheria from which they died. Another of the positive cases, convalescing from broncho-pneumonia was confined in a small room with twelve inmates. Two other of the positive cases had been for a considerable period in a large room with many inmates, and *from the dust of this room the streptococcus was cultivated.*

In a second series of examinations cultures were made from the tonsils of children which had been for varying periods in the same hospital, and had died of various diseases not diphtheria. There were in this class fifteen cases; twelve of these were cases of marasmus with more or less broncho-pneumonia or entero-colitis; one was a case of pertussis with extensive interstitial emphysema; one, which had been for a long time in the hospital, died with symptoms of suffocation, the autopsy revealing only œdema of the lungs; the other was a case of erysipelas following vaccination and extending over the entire arm and chest. Of the 12 marasmus cases, 7 showed no streptococci; in 4 the streptococci were found in small numbers, but only in deep scrapings from the tonsillar crypts and folds. These 4 cases in which the streptococcus was found had all been for considerable periods in the hospital; they were all confined in rooms in which at the time diphtheria was occasionally originating. One of these had been for several days in a room with a number of eczema cases, another in the "eye-room" with a number of cases of purulent conjunctivitis. Of the 3 remaining cases, the one with pertussis showed no streptococci; the one with pulmonary œdema and the one with erysipelas showed a few. We thus see that from scrapings, mostly from the tonsillar crypts or the folds of mucous membrane about them in 15 children dead of various diseases not diphtheria, in a large

children's asylum in which diphtheria was constantly occurring, the streptococcus was found in 6.

If now we summarize the results of the cultures of scrapings from both the dead and living children in this institution in which diphtheria was prevalent, we find that in 12 cases out of 40 small numbers of streptococci were present in and about the tonsils of children not at the time suffering from diphtheria. In 2 of these, fatal diphtheria shortly developed. The comparison of this result with that of similar cultures from the tonsils and throats of well and sick children outside of this hospital and mostly in private practice given above is striking. For in these, from scrapings from 31 cases, the streptococcus was cultivated in only 2 which were suffering from scarlatina at the time, and which both developed diphtheria shortly after. The significance of these collateral observations is, I think, evident and needs no comment.

It should be said that the identity of the streptococci isolated from these control cases with those found in diphtheria was established, not only by their morphological and biological characters, but by the results of their inoculation in animals, the details of which it is not necessary to enter into here. The only difference which I observed between the streptococci from the control cases and those from diphtheritic membranes was that, in general, the former were, for the most part, a little slower in their growth, and their effects upon animals a little less pronounced. They produced, in a large proportion of the inoculations, either erysipelas, inflammation in the ear of rabbits, or small abscesses; but the abscesses were invariably small, and the inflammatory reaction short-lived.

The Relationship of the Streptococcus Diphtheriæ to other Species of Bacteria.

We have now arrived, by an independent series of observations on a group of cases of diphtheria, at a definite and precise notion of the species of bacteria which appears to stand in a causative relation to the disease. If we compare this species, which we have called the streptococcus diphtheriæ, with those species of bacteria already known and fully described, we find that, in its forms and in its modes of growth, as well as in its effects when injected beneath the skin or into the blood of animals, it appears to be identical with two well-known species, called streptococcus pyogenes and streptococcus erysipelatos. I have carried the cultures of streptococci from cases of diphtheria along side by side with cultures of streptococci made from various cases of simple acute erysipelas and simple phlegmonous inflammation, week after week; over and over again, I have stained, measured, and compared the growth from these three sets of sources. I have repeatedly inoculated duplicate sets of animals with the different cultures, and I have never found a single appreciable constant feature of difference between them. There are, it is true, often differences in rapidity

and vigor of growth on artificial culture media, as well as differences of virulence, as the result of inoculation of animals, between cultures derived from the different sources. But these differences are no more marked between cultures from erysipelas, phlegmon, and diphtheria than those often observed between cultures derived from different cases of the same disease.

While it is not possible, with our present knowledge, to characterize precisely the difference in action, upon the animal tissues, of the streptococcus pyogenes and the staphylococcus pyogenes, associated, as they so often are, in the phlegmonous inflammations; in general, the streptococcus appears to be more prone to cause the spreading, progressive form of inflammation, and to give rise to general infection, than is the staphylococcus, the more marked tendency of which is to give rise to localized suppurative inflammations, abscesses, etc. Both forms of bacteria may, indeed, induce suppuration and abscess, and both may cause more or less widely spreading phlegmonous inflammation; but the special tendency of each appears to be that which I have stated.

It is worthy of note, in this connection, how often the streptococcus has been found associated, apparently as the etiological factor, with those inflammations, particularly of the serous membranes, in which the formation of fibrin is a most marked feature.

To enter here into the story of the discussions as to the identity of the streptococcus of erysipelas and the streptococcus pyogenes would lead us far afield, and bring us at last to no very definite result. The fact is, that nearly every practical worker in bacteriology, who concerns himself with these particular species, appears to find himself forced by his observations to the conclusion that, in their morphological and biological, and, for the most part, in their pathogenic, characters, so far as animals are concerned, the streptococcus pyogenes and streptococcus erysipelatos are practically identical. Nearly every one, however, hesitates to declare absolutely their identity, not on the ground of morphological or biological or experimental discrepancies, but rather because clinical experience and observation have for so long sanctioned the belief that erysipelas and simple phlegmonous inflammation are distinct and separate diseases. The close relationship existing between these three forms of inflammation has long been the subject of observation and speculation, and the probable unity of the causative bacterial agent has been set forth with much interesting detail and critical acumen by Baumgarten (14), as well as hinted at by others.

The Relationship of Diphtheria to Erysipelas and Phlegmonous Inflammation.

Whether the clinical differences between erysipelas and those forms of suppuration in which the streptococcus pyogenes occurs cannot be explained—perhaps, by the mode or seat of invasion, by variation in viru-

lence or the resisting capacity in the individual, or in some other way—are questions which further observations must answer. That a simple erysipelatous and a phlegmonous or suppurative inflammation very frequently merge into one another is well enough known to all. That different effects should be produced by the same species of bacteria growing in the lymph spaces of the skin, or in the depth of other forms of tissue, or on the mucous membranes or wound surfaces, is by no means incomprehensible, and is not without abundant analogies in the life-history of other organisms. What the exact bearing of these differing conditions under which the bacteria grow, and what their relations may be to the symptoms and lesions, are matters for further investigation. But it is, after all, the pseudo-membrane—a structure either fibrinous or necrotic, or both, in its nature, and the seat of its most frequent occurrence, namely, the upper air-passages—which especially characterizes diphtheria in its common phases. Now, given a bacterium, like the streptococcus, capable of inducing a marked irritation and necrosis in the tissues, and set it growing in such enormous numbers as are seen in many cases of diphtheria on a mucous membrane, or on the granulation tissue of a healing wound, where the smaller bloodvessels are abundant and close at hand, and the conditions are abundantly fulfilled for the induction of emigration of leucocytes, formation of fibrin, and localized necrosis of the involved tissues—the conditions, in other words, for the development of a necro-inflammatory pellicle over the affected surfaces. At any rate, the position into which we are led by these studies is simply this: There seems to be experimental ground for the belief that some forms, at least, of diphtheria and erysipelas, and some forms of phlegmonous inflammation, are phases of the inflammatory process having one, at least, of their prominent etiological factors in common, namely, the inciting species of bacteria.

It should be remembered that to admit this is by no means to identify these diseases: no important clinical tradition is thereby overthrown. The different phases of inflammation become, it is true, by this conception of them more intimately related to one another. But, on the other hand, those factors which determine that infection with the one form of germ shall induce now a diphtheritic, now a phlegmonous, and now an erysipelatous inflammation, become, from this point of view, of even greater importance than before.

However iconoclastic this view may seem to those who have been accustomed to regard these phases of inflammation as entirely distinct, there seems to be a large amount of evidence other than that derived from experiment which favors the view to which these studies, somewhat unwillingly it must be confessed, have led the writer. In the first place, every practising physician knows how frequently suppuration occurs as a local complication of the diphtheritic process. The occasional simul-

taneous occurrence of severe umbilical phlegmon with pharyngeal and laryngeal diphtheria in the same child is not without significance in this connection, especially in view of the identification, in two of the cases noted above, of the same species of streptococcus, both in the suppurating tissues about the umbilicus and in the pseudo-membrane in the air-passages.

The occurrence of a diphtheritic inflammation of the mucous membrane of the uterus, which occasionally forms one of the manifestations of puerperal fever, in connection with which the streptococcus pyogenes has so often been demonstrated, is also a significant fact.

The reputation of diphtheria as a sewage and filth disease is much more comprehensible than before when once we recognize the close relationship which seems to exist between at least some of its forms and the suppurative diseases. If the bacteria which act as the inciting cause of diphtheritic inflammation be forms peculiar to this disease alone, it is rather difficult to account for the occurrence of sporadic cases of diphtheria in which there is no evidence of direct communication of the disease from one individual to another. But if we admit the causal relationship between the streptococcus of suppuration or erysipelas, and some cases of diphtheria, nothing could be more evident, because the discharges from all sorts of suppurating wounds and surfaces form a very common and important bacterial element, not only in sewage, but in the air of our crowded dwellings and hospitals. But we need not go with more detail into these general considerations, which the experiences of every practising physician will enable him richly to supplement.

It should, however, be always borne in mind that in most of the acute infectious diseases as we see them in man, while the bacteria serve as the inciting cause, without which the particular form of disease could not, as we believe, exist, there are other and most important contributory factors which can by no means be ignored, and which are daily assuming a greater and greater importance. These contributory factors to the occurrence of an acute infectious disease are often those to which the attention of the practitioner has been more especially directed in his observations on these diseases, and, consequently, are often regarded by him as the etiological factors themselves. Thus it was that at the announcement by Koch, in 1882, that the bacillus tuberculosis was the etiological factor in tubercular inflammation, many whose attention had been prominently directed toward the important influence of hereditary predisposition, were disposed to doubt, on this ground alone, the importance of the bacillus in causing the disease. A similar condition of affairs has been revealed in acute lobar pneumonia. The importance of exposure to cold and wet, injury, etc., in inducing the disease is just as evident now as ever it was, only we are now aware that the exposure, etc., appear to be but predisposing factors, which explain why in one case an individual

may harbor in his saliva or elsewhere the bacterium of pneumonia without experiencing the slightest evil, while in another, exposure or other deleterious agencies rendering the conditions favorable for the development of the germ, an acute lobar pneumonia may ensue.

The important relationship between measles and diphtheria, and between scarlatina and diphtheria, appears in the light of these studies but another illustration of the same conditions. The universally recognized danger in both measles and scarlatina, namely, that diphtheria may occur as a complication, is amply illustrated by the history of epidemics of both measles and scarlatina in any of our large children's hospitals. That tissues which are ordinarily invulnerable to the growth and action of pathogenic bacteria may become very susceptible to their presence by a slight chemical change in the material present, is shown by the recent striking experiments of Bujwid (15), who found that the introduction of a small amount of solution of grape sugar into tissues which did not usually react at all in the presence of the staphylococcus pyogenes aureus would lead them to do so readily with the production of abscess. That some such slight change in the exudation of the mucous membrane of the air-passages as occurs in the catarrhal inflammation of scarlatina and measles might favor the growth of bacteria which had lain dormant and harmless in the tonsillar crypts or elsewhere in health, seems, in the light of these studies, a justifiable hypothesis. With the concurrence of Dr. Northrup, I have endeavored to ascertain whether any change in the reaction of the fluids of the mouth and throat occurred at the advent of measles and scarlatina which would render them more favorable for the growth of the streptococcus; but our studies in this direction have thus far led to no tangible results.

It should be distinctly understood that these studies on the etiology of diphtheria and the conclusions derived from them apply only to a certain set of cases. It by no means follows that because this particular group of cases of diphtheria is caused by a streptococcus, and seems to be intimately related in etiology to some other common phases of inflammation, that all cases of diphtheria are induced by the same organism or are related in the same way to erysipelas and phlegmon.

That other organisms than the streptococcus here described may induce that set of symptoms and lesions to which we give the name diphtheria, we must, of course, admit, and this the more readily on account of the great variability of both symptoms and lesions in even well-marked groups of cases. So far as Loeffler's experiments go, they tend to indicate that some other forms of bacteria really may play a part in the induction of certain forms of the disease. But it is not without significance that Loeffler also found a streptococcus very similar to that which I have found in our cases, not only in connection with his bacillus, but in several cases in which the bacillus was absent.

The statement of Loeffler, that the cases in which the streptococcus was present were apt to be those in which the pseudo-membrane was not greatly developed, and in which the necrotic character of the inflammation prevailed, certainly does not apply to the cases which I have studied; for in more than one-half of my cases the pseudo-membrane was both voluminous and extensive.

The fact that Klebs, Heubner and Bahrdt, Babes, Emmerich, Oertel, Baumgarten (16), and many others have been led on either morphological or biological grounds to attribute much significance to a streptococcus in causing diphtheria should be placed in evidence here.

If the streptococcus which we find so constantly in diphtheria be specifically identical with the streptococcus of phlegmonous inflammation and of erysipelas, the propriety of giving it a special name might well be called in question from the point of view of scientific nomenclature. But when we consider that bacteriology is still in its earliest infancy, and that both its classifications and nomenclature are only tentative and temporary, pending a greater accumulation of facts, such a special name without prejudice to future revision may serve for use until the whole bearings of the subject are better defined.

The Effects of Drying on the Streptococcus Diphtheriæ.

In view of the fact that diphtheria may be communicated by portions of the inflammatory exudate containing the streptococci, it seemed desirable to learn how long the germ could resist the deleterious effects of drying, such as would occur should portions of the exudate become distributed about rooms or upon fabrics.

The first set of experiments was made upon pure cultures of the streptococcus. Fresh and actively growing beef-tea cultures from three to five days old were prepared, and, after being thoroughly shaken so as to distribute the bacteria uniformly through them, sterilized bits of silk thread, pieces of flannel, etc., were soaked in them for a few moments and then dried in sterilized flasks and tubes. These fragments of thread and fabric were now planted from time to time in order to see whether the bacteria had been killed or not by the drying. This set of experiments was done with cultures from five of the diphtheria cases.

I have not sought to obtain numerical results in these experiments because I soon found that the streptococci from the different cases varied a good deal in their capacity to remain alive in the dried condition. In general, it may be said that a considerable number of the germs are killed by drying, but in all of the experiments a very large number were not killed. Thus I have at intervals from eight to ten days replanted the dried germs, and, up to eighty-five days, the longest period to which I have carried the experiment, large numbers grew most

vigorously from the dried cultures. I have inoculated rabbits with the offspring of these dried germs and found them extremely virulent, inducing marked and violent erysipelatous inflammation. I have found, however, that the streptococci from some of the cases, while resisting the drying very well, and retaining the power when replanted of growing vigorously, had, nevertheless, become much less resistant to the action of the germicidal fluids than they were before drying.

But, as it might be objected that the results of drying the pure cultures would not necessarily be the same as the drying of the streptococci in the membranes themselves, as might happen in practice, I have dried fragments of the fresh membranes from a number of the cases on the smooth walls of tubes and flasks. These dried bits of membrane I have scraped off from time to time, and in every case up to fifty-four days, the longest period to which any experiment was carried, large numbers of streptococci grew vigorously, together with some other forms of bacteria.

Thus we find, as the result of these drying experiments, that the streptococcus diphtheriæ when dried on smooth surfaces or fabrics, either in the form of pure cultures or in the crude pseudo-membranes, may retain its vitality and virulence for long periods.

Effects of Freezing on the Streptococcus Diphtheriæ.

As the possibility has been suggested that the exposure of infected rooms and their contents to the cold in winter might accomplish the destruction of the contagion of diphtheria, I have exposed, to a temperature below freezing, the streptococci from several of the cases of diphtheria placed on fabrics. The germs in one of the sets of experiments were dry; in another were thoroughly wet. The exposure to a temperature of —10° C. (14° F.) for seventeen hours did not destroy the vitality of any considerable proportion of the germs.

Exposure of the pseudo-membrane from two of the cases of diphtheria, both in the wet and dry conditions, to the same temperature for the same period, showed that under these conditions also the germs may resist an extreme degree of cold.

The conditions under which steam sterilization is effective have been so frequently and so fully worked out that the effects of high temperature upon the streptococcus diphtheriæ were not studied.

The Effects of Germicides on the Streptococcus Diphtheriæ.

Sulphurous acid. Although the vapor of burning sulphur has been repeatedly shown to be of but very moderate value as a germicide, the fact that it is still so generally relied upon in this country, especially for the disinfection of rooms, has led me to carry out a series of experiments on its effects upon the streptococcus diphtheriæ.

In these experiments, I have used a glass bell-jar, of about one gallon capacity, into which the objects to be treated were lowered by means of fine platinum wires through an opening in the top. The articles were placed in little metallic baskets, which were carefully sterilized before each experiment. The sulphur was burned in a small dish at the bottom of the receiver, and the whole apparatus was tightly sealed, top and bottom, at each operation. The receiver, in all cases, remained closed for twenty-four hours, and, when opened, the contained air was invariably still strongly charged with the vapor. It is evident that the conditions under which the experiments were done with this apparatus were much more favorable for the action of the sulphurous acid than in the disinfection as it is usually practised in larger chambers which are rarely, if ever, perfectly tight.

I first tried the power of the sulphur vapor to kill the streptococcus in pure cultures, in a perfectly dry condition, in the interstices of threads and fabrics. Cultures from several of the cases of diphtheria were thus exposed to the vapor. I have never been able to kill more than a small proportion of the bacteria in this way when they were taken from fresh, vigorous cultures. If the bacteria had been dried for a long time, so that they were in a feeble and vulnerable condition, it was found, in a few cases, that all had been destroyed by the vapor.

Another set of experiments was done, similar to those above described, save that the fabrics on which the streptococcus was previously dried were moistened just before the sulphur was burned in the receiver. This moistening, in one set of cases, was done by the direct application to the fabrics of sterilized distilled water; in another, by conveying condensed steam into the receiver, just before the sulphur was burned, until the water began to collect and run down the walls. Under these conditions, all the streptococci were killed within twenty-four hours.

A similar set of experiments on the action of sulphur vapor was made with the dried pseudo-membrane from cases of diphtheria. In these, I found that, whether dry or previously moistened, I could, in no case, succeed in killing all the streptococci by a twenty-four hours' exposure to the vapor. The difference of the action of the vapor on the pure cultures and on the streptococci enclosed in the pseudo-membrane is obviously due to the circumstance that, in the pure culture, there is direct contact between the acid and the germs, while in the membrane there is not.

We thus see that, while the moist sulphur vapor is more efficient than the dry in destroying the streptococcus diphtheriæ, in either form it is entirely inefficient for the purposes of practical disinfection.

Carbolic acid. In determining the germicidal power of this agent for the streptococcus diphtheriæ, a different mode of experimentation was adopted. A measured volume of actively growing beef-tea culture was

intimately mixed, in sterilized tubes, with an equal volume of a freshly prepared aqueous solution of the acid. This, of course, would give the effect of a solution of one-half the strength of the carbolic solution employed, because it was diluted one-half by the fluid culture. In this way varying strengths of the acid were tested. As the length of exposure to the germicide is a most important factor in such tests, small portions of the mixture were removed from the tube, and instantly planted in gelatine, at the following intervals: ½, 3, 5, 10, 15 minutes. Approximately equal amounts were removed each time, by the use of a fine platinum wire loop. The portions removed were planted in gelatine tubes, by the Esmarch "roll" method, and in this way the number of colonies which appeared after from 3 to 5 days could readily be counted, and represented, of course, the number of germs which had survived the action of the germicide. In each case, a control-plant was made from the original culture, so that the number of germs destroyed could be approximately determined. Of course, absolute accuracy in determining the number of germs destroyed was neither sought for nor desired, but only such data as would indicate, in a general way, the efficiency of the germicide. I do not deem it necessary to reproduce here the numerical tables which embody the results of these experiments; I shall simply summarize the results. Cultures from several of the diphtheria cases were used, and the experiments repeated for control.

In ½ per cent. solution of carbolic acid, the bacteria were slowly killed; but at the end of 15 minutes, about $\frac{1}{6}$ of the original number remained alive. In 1 per cent. solution, a large proportion were killed within 1 minute, and, after 3 minutes' exposure, none remained alive. In 2 per cent. solution, a total destruction occurred within 1 minute.

That it would be most unsafe to base rules for practical disinfection, however, upon the power of carbolic acid to kill the streptococcus diphtheriæ in pure cultures is shown by the following experiments on fresh pseudo-membranes. Small fragments, about 4 mm. square and 1 mm. thick, were put in 1 per cent. carbolic solution. Some of these were removed at the end of fifteen minutes, and planted; large numbers of streptococci grew, together with other forms. At the end of thirty minutes, plants showed that still a considerable number had remained alive. At the end of forty-five minutes all were dead. A similar series of experiments, with 2½ per cent. carbolic acid, showed that within fifteen minutes all of the streptococci were killed. In much more dilute solutions of carbolic acid (1 : 4000), soaking of the pseudo-membrane for an hour and a quarter had no appreciable effect upon the vitality of the streptococcus.

We thus see that carbolic acid, in order to be of practical efficiency in destroying the streptococcus diphtheriæ, must be used in at least 2 per cent. solutions, and that its action must be prolonged.

Creolin. The experiments on the effect of this agent were made because of its highly lauded germicidal power, and because it has been claimed by many to be less harmful in its effects upon the organism than is carbolic acid, which in many respects it resembles. The preparation used was Merck's, and it forms with water in the strengths employed a milky, tarry-smelling fluid. The mode of experimentation was the same as with carbolic acid.

In solutions of 1 : 1000, about $\frac{1}{20}$ of the streptococci remained alive at the end of 15 minutes. In solutions of 1 : 500, a considerable number remained alive at the end of 15 minutes. In 1 : 200 solutions, all were destroyed at the end of 15 minutes. In 1 per cent. solutions, all were dead at the end of 3 minutes. Thus, creolin in solutions of equal strength, appears to be a little more efficient in killing the streptococcus diphtheriæ than is carbolic acid.

Bichloride of mercury. The experiments with this agent were similar in character to those with carbolic acid and creolin.

In solutions of 1 : 5000, from $\frac{1}{6}$ to $\frac{1}{40}$ of the germs introduced as pure cultures remained alive up to the end of 1 minute. At the end of 3 minutes all were dead. In solutions of 1 : 2000, as well as 1 : 1000, complete destruction had occurred at the end of $\frac{1}{2}$ of a minute.

With the streptococci embedded in, and partially protected by, the pseudo-membranes, however, the effects are markedly different. Bits of pseudo-membrane, like those used in the carbolic acid experiments above, were soaked in solutions of varying strengths, with the following results: In 1 : 10,000, for 1 hour and 10 minutes streptococci grew in large numbers. In 1 : 5000, after 15 minutes a few grew; other fragments removed after 30, 45, and 80 minutes showed no growth. In 1 : 1000, after 15 minutes' soaking of the membrane a few streptococci grew. After this period, at intervals of 30, 45, and 80 minutes there was no growth.

We thus see that a fragment of diphtheritic pseudo-membrane must be soaked for from 15 to 30 minutes, in solutions of sublimate as strong as 1 : 1000, to accomplish a destruction of the streptococcus which in pure cultures, where there is perfect contact, may be achieved in half a minute.

I regard the numerical results of these experiments with germicides as of very little importance, save as giving general indications as to the absolute and relative power of killing the streptococcus, because, as already stated, of the great variability in the vigor of the germ from different cases and under a variety of conditions.

In the disinfection of objects, both the strength of the germicide and the length of exposure should be carried with large allowance beyond the point which such experiments may indicate as efficient. In the use

of germicides in treatment, on the other hand, the limit will be usually sharply defined by the tolerance of the body to their poisonous effects.

Summary.

We have found, by a critical examination of the studies which have heretofore been made on diphtheria by the use of the modern methods of research, that no definite species of bacteria has been discovered which could fairly be positively regarded as the cause of the disease.

We have studied in detail, both by morphological and biological methods, twenty-four cases of diphtheria in young children, most of them occurring in hospitals, in which the affection has assumed the character of an epidemic, the disease either occurring by itself or in connection with suppurative diseases, or scarlatina, or measles. In all but two of these twenty-four cases, we have demonstrated the presence of a streptococcus, usually in large numbers in the local lesions, and in small numbers, in a few of the cases, in the viscera.

We have established, by the biological methods, the specific characters of this streptococcus, and by animal inoculations in rabbits and pigeons have found that it is markedly pathogenic, inducing erysipelatous or phlegmonous inflammation, abscess, and localized necrosis. We have not succeeded in inducing on the mucous membrane of animals any lesions which could fairly be regarded as similar to the local lesions of diphtheria, as these are ordinarily developed in man. We have found, however, that diphtheria as we see it in man, does not apparently occur spontaneously in animals, and has not been induced experimentally by any of the numerous and variously modified inoculations thus far practised.

We have in control examinations of mouth and tonsil scrapings from thirty-one healthy and sick children, not apparently exposed to diphtheria, never found the streptococcus, except in two cases of scarlatina in which diphtheria soon after developed. On the other hand, in examining throat and tonsil scrapings from forty children exposed to the disease in a hospital in which it was epidemic, we have found the streptococcus in twelve of them. In two of these, fatal diphtheria soon followed. Once we have found it floating in the dust of the room in which the disease had originated. We have seen that all of these observations, taken together, seem to lead us to so strong a presumption that the streptococcus is the causative factor, in this group of cases, at least, of diphtheria, that it practically amounts to a demonstration.

We have found reason for believing on biological and experimental grounds that the streptococcus occurring so constantly in these cases of diphtheria is probably identical with the streptococcus pyogenes and streptococcus erysipelatos. It has been shown that the apparent identity

of the inciting species of bacteria in erysipelas, in some forms of phlegmonous inflammation and in at least certain groups of cases of diphtheria is not only not inconsistent with our knowledge of the pathology and symptoms of these three forms of inflammation, but serves to account for various facts concerning the nature and spread of diphtheria which have hitherto seemed obscure.

We have found that the crypts of the tonsils form a favorite nesting-place for the streptococcus and that it may lie harmlessly there even in considerable numbers, unless some lesion of the mucous membrane provides conditions suitable for its growth, when it may enter upon a career of active and, as it would seem, fateful proliferation.

In the presence of the streptococcus in large numbers in the local lesions of diphtheria and in its absence in any considerable number as a rule in the internal organs, we find ground for the belief that the symptoms of systemic infection are probably in large measure due to the absorption of a soluble poison produced by the bacteria at the seat of their most active proliferation.

We have demonstrated that the streptococcus of diphtheria is not readily destroyed by drying, but both in the form of pure cultures on threads and fabrics and in the pseudo-membrane itself may retain its vitality for long periods when dried in the air. We have tested its vulnerability when brought in contact with some of the commonly used antiseptic agents and found first that the vapor of burning sulphur is very inefficient and unreliable in destroying the germs. We have found that carbolic acid and creolin in considerable strength destroy the streptococci but in dilute solutions are inefficient; while sublimate even in very dilute solutions heads the list in its killing power. But we have also found, as was to be expected, that all of these germicides are much less efficient when applied to the bacteria which lie embedded in the pseudo-membranes and the tissues, than when they are free in the pure cultures.

Prophylaxis.

Having now accumulated a certain amount of definite knowledge about the germ which appears to be capable of inducing diphtheria, let us see how this knowledge may be applied in the prevention and in the treatment of the disease.

It is a well-established fact, to which the personal experiences of many a practising physician can bear witness, that diphtheria may be directly communicated from one individual to another by means of portions of the fresh pseudo-membrane. With this mode of transmission we have nothing to do. That it may be communicated in some less tangible way, either during the illness or long after, in garments, bedding, furniture, the walls of rooms, etc, is equally well established. But in the latter

mode of infection our lack of knowledge about the nature of the disease germ has made it impossible for us to understand in detail its exact mode of transmission. In the light of these studies, however, this would seem to be tolerably plain.

We have seen that, in a certain group of cases at least, diphtheria may be caused by a streptococcus; that this streptococcus may retain its vitality for long periods when dried in fragments of the pseudo-membranes or in mucus. Now this dried material when detached and broken up forms a part of the dust of the room in which it is set free, and like other dust may be inhaled. Exposed again to moisture, warmth, and such food as the mouth and respiratory passages abundantly furnish, the germs, as our experiments have shown, may revive and grow. Wherever then a particle of diphtheritic exudate dries on walls or garments or elsewhere we have apparently a possible source of infection—the conditions of its dissemination being those which equally control the spread of non-infectious dust. That drying destroys a certain proportion of the germs which a diphtheritic pseudo-membrane contains is shown by our experiments. How long a part of them may remain alive we do not know; but it appears from the experiments that the vitality as well as the virulence of the streptococci varies a good deal in different cases. That the germs cannot detach themselves from moist surfaces, such as the mucous membranes, and carry contagion through the expired air has been established by experiments on other infectious diseases.

We thus see that, save for those liable to come in contact with fresh diphtheritic exudates, the danger of infection seems largely to limit itself to exposure to dust and dirt of which the dried exudate forms a part. There seems to be every reason for believing that in the hospital from which most of our cases came, the dust infection was the common mode.[1]

This condition of affairs but emphasizes the probability that in the crusade against fifth and filth diseases, the devotees of cleanliness and prophylactic medicine will find in the immediate future a wide and widening field of labor in impressing upon the public the dangers of infectious dust in overcrowded houses and hospitals and filthy city streets and showing them the ways in which its evils may be avoided.

Already it has been shown that one of the most active sources of contagion in tuberculosis is the dust of rooms in which without due cleanliness consumptive individuals have lived. Antiseptic surgery has adopted such practical procedures as imply the belief that all dust-containing air may be infectious so far as wound diseases are concerned. There is much reason for believing that the pneumococcus is disseminated in the same way.

[1] As to the relationship of erysipelas and phlegmonous inflammation to diphtheria, as affording a source of infection, we need not dwell upon it here since the same conditions would seem to apply as in the transmission of the contagion from one case of diphtheria directly to another.

House disinfection. Having thus brought together the facts bearing upon the mode of communication of diphtheria which these studies embody, the practical deductions as to general sanitary precautions against the spread of the disease are comparatively simple. The immediate destruction so far as possible of all the inflammatory exudates which may be discharged is of primary importance. These should be received at once so far as possible into vessels containing 5 per cent. solution of carbolic acid, where they should remain for at least an hour before being thrown into the sewer. The removal of dust settled about the room which may contain particles of the exudate not destroyed—by means of moist cloths, and never by that barbaric survival, the feather duster—and the efficient disinfection of clothing and rooms liable to contamination; these seem to be the other main points.

It is a great pity that in the matter of disinfection of rooms we should in this region still be going through with the inefficient mummery of burning sulphur with closed doors under the impression that it will destroy contagion. This operation has, indeed, a certain archaic picturesqueness about it, and save for the damage which is liable to accrue from the fading of furniture and hangings, is a tolerably harmless practice; but it savors rather of the propitiatory sacrifices to malevolent deities of centuries gone by than of the intelligence of the present time. Sulphurous acid, as it is usually applied in house disinfection, has been shown over and over again by the most careful experiments to be a very inefficient and unreliable disinfecting agent. It may be better than nothing, but in disinfectants—which are often our sole weapons in fighting epidemics—the best is none too good. The efficiency of sulphurous acid may be increased by securing the thorough wetting of everything to be disinfected, but even then it is not great.

As to the details of a mode of room disinfection upon which we may rely, I think it may not be out of place here to formulate a set of directions which largely embody, and are in part a transcript of the official regulations for disinfection as required by the health authorities in Berlin in 1887.

All bed-linen, clothing, handkerchiefs, etc., which are to be washed, and all cloths which have been used for dusting the room, should be placed for at least twenty-four hours in 2 per cent. solution of carbolic acid, then boiled for an hour in water, and then washed with strong soapsuds.

The disinfection of the room and its contents at the close of the illness will be the more easy, and certainly efficient, the greater the care which has been exercised in removing all unnecessary articles of furniture, hangings, pictures, etc., from it at the commencement of the disease.

In the first place, all clothing which cannot be washed, bedding, mattresses, pillows, etc., carpets, cushions, and all such furniture as has not

exposed wooden frames, should be tied up in cloths (sheets) which are saturated with 2 per cent. carbolic solution, and sent away to be steamed at the public disinfecting station.[1]

All valueless articles of furniture or clothing should be burned—best at the disinfecting station—but in case of necessity the smaller articles may be disposed of in the house furnace or range at such time as cooking is not going on.

Polished articles of furniture, picture-frames, metallic articles, etc., should be firmly rubbed off on all their surfaces with dry cloths, or, when permissible, with cloths wet with 5 per cent. carbolic acid. The cloths used should be immediately burned or put into 2 per cent. carbolic solution.

If the walls of the room are hard-finished or painted, they, together with all doors, windows, and woodwork, should be thoroughly washed, as should finally the floor, with 5 per cent. carbolic solution. If the room have papered or frescoed walls, the floors should be thoroughly flushed with 5 per cent. carbolic solution, and then all the walls should be thoroughly and firmly rubbed down in every part with lumps of bread, the crumbs being allowed to fall on the carbolized floor. Then the woodwork is washed with carbolic solution, the crumbs gathered up and burned, and the floors washed with water.

The room should be finally exposed as fully as possible to the air for at least twenty-four hours, and longer if it is practicable.

Now, this will seem at first, no doubt, a very formidable process, but where a large public disinfecting plant is available it is, after all, comparatively simple; and, what is much more important, if faithfully and intelligently executed, will insure purification of the infected room. Of course, other germicides than carbolic acid might be used for washing the room, such as 1 : 1000 sublimate solution, but the experimental data which these studies furnish indicate that the carbolic solution will kill the streptococcus if it comes in contact with it.

Treatment.

That which these studies furnish in the way of suggestions for the treatment of diphtheria has already been indicated—at least for him who reads between the lines—in every fact set down regarding the life-history and vulnerabilities of the streptococcus and its relations to the varying phases of the disease. The obvious lesson taught by a definite conception of the nature of the germ which causes diphtheria is not to

[1] A large and well-arranged disinfecting plant is now being planned for the city of New York, and will, it is hoped, soon be in operation Where such disinfecting stations do not exist, as they should in every large town, a thorough scrubbing of the surfaces of mattresses, pillows, etc., with 2 per cent carbolic solution and subsequent prolonged exposure to the air, and boiling of blankets, coverlets, etc., after washing in the carbolic solution, will be perhaps the best procedure.

dally with fancy mixtures which have at best a moderate germicidal power, but to get at the growing germ, as directly as the seat of the lesion will permit, with some agent which we know will kill it.

It does not lie within the scope of this paper to suggest any detail as to the treatment of diphtheria. But the points which I would especially emphasize are: First, the evidence here adduced that the germ primarily gains a foothold at the seat of the local lesions, inducing its general effects upon the body at large by the local production of an absorbed ptomaine; second, the vulnerability of the germ to certain commonly employed germicides; third, the propriety of making germicidal applications to the mouths and throats of individuals liable to infection. It will thus be seen that the immediate practical outcome of these studies, so far as the treatment is concerned, is rather to confirm the importance of local antiseptic methods, and to give precision to the ends which we may hope to attain by them, than the suggestion of anything new.

The writer hopes, in conclusion, that these studies, by lending clearness to our conception of its nature, may aid in the control as well as in the treatment of a disease which, in town and country, in this and other lands, claims yearly so many victims.

February 7, 1889.

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ELECTROLYSIS.

Proper and Improper Methods of using it in the Removal of Hairs and Kindred Operations.

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It might seem as if the last word had been said for the removal of hair by electrolysis, and yet daily experience convinces me that much more remains to be said. The operation as ordinarily performed leaves scars of greater or less magnitude, and as long as this is the case the operation is not a complete success. All writers that I have read admit that scars necessarily follow the operation. Fox, White, Amory, Hardway, Duhring, and Jamison make this admission. The writer confesses to having formerly expected similar results. It is true that the magnitude of these scars varies inversely with the skill of the operator, and it is possible that in the hands of an experienced operator like any of those just mentioned, they may be reduced to a minimum of disfigurement.

"If the operation is very skilfully performed," says Fox, "it ought not to leave scars *as a rule*.[1] In some cases it is impossible to prevent the production of minute punctate cicatrices, which, however, can only be seen on close inspection." As a result of still further experience he says: "Without the requisite skill, which comes only from practice, an unnecessary amount of pain is usually inflicted upon the patient; a considerable degree of inflammation of the skin is occasioned; disfiguring scars are apt to be produced, and a large proportion of the hairs operated upon are apt to return: but when the operation is properly performed the pain is slight, the inflammatory reaction is scarcely noticeable, no *disfiguring*[1] scars result, and the permanent removal of the hair is assured." "In the majority of cases it is possible to remove hair from the face without leaving any permanent mark, but unless an unusual amount of care is exercised a number of faint punctate cicatrices may sometimes be left as a result of the operation. But these are usually insignificant, being only apparent upon a very close inspection of the skin in a good light, and they are rarely thought worthy of consideration by the patient who is rejoicing over the permanent removal of the hairs."[2]

But every one has not the experience and consequently cannot acquire the skill of the author quoted. Though in his skilful hands the operation may not result in greater blemishes than he describes, in the hands of others with less experience it does result in unsightly disfigurement, as he himself points out. The fault lies, I am satisfied, in imperfect methods, insufficient apparatus, and erroneous notions of electro-physics, rather than in the personnel of the operators; and though Dr. Fox and

[1] Italics not in original.

[2] The Use of Electricity in the Removal of Superfluous Hairs Detroit, Mich.

a few others may be able to compensate by great skill and experience for such insufficient apparatus and faulty methods, to others less skilful, but yet ambitious to perform the operation, this is not vouchsafed. And after all, the "minute cicatrices" described are blemishes and undesirable, even though not complained of by grateful patients.

An illustration of the unfortunate results of the operation was forced upon the writer's attention recently in the person of a very handsome young woman whose marked beauty was marred by the unsightly scars which appeared, at first sight, to have been smallpox, but closer observation showed they had been artificially made by electrolysis. When it is remembered that with proper precautions and with proper apparatus these scars were *entirely unnecessary*, one can understand the gravity of the accident that caused them.

That this disfigurement of the face by unsightly scars is no infrequent accident a little observation in the street will satisfy any one for himself. Certainly the experience of the writer enables him to see numerous patients who have been thus disfigured.

The purport of this paper is to emphasize the value of certain methods of using electrolysis in order that the best results may be obtained.

Continued experience has demonstrated to me that when one can operate under his own conditions scars, even minute cicatrices, are absolutely unnecessary.

The principal reasons for disfigurement of this kind are either, first, unnecessarily strong currents; or, second, currents of unnecessarily long duration. The first, when not intentional, is due to either, *a*, not using suitable means for measuring the current; or, *b*, not using suitable apparatus to insure a definite current of a constant, pre-determined strength.

In a paper published in the *Boston Surgical and Medical Journal*, November, 1886, I called attention to the necessity of always using an absolute galvanometer in the circuit. In this paper the fact was pointed out that with the apparatus usually employed the strength of the current varied immensely, sometimes fivefold during the course of a sitting, owing to variations in the wetness or dryness of the electrodes, the amount of pressure with which they were applied, etc., and to recognize these oscillations in the current an absolute galvanometer was necessary. So far as the use of the galvanometer is concerned, I have little to add to what was said then.

To use electrolysis without one at this date seems little less than inexcusable blundering, though I am surprised to find little or no reference to such an instrument in works on dermatology. To neurologists who are familiar with the use of electricity, the neglect to use a galvanometer by those who use electrolysis seems incomprehensible. What was said in the paper just referred to regarding the possibility of avoiding scars by this means has been confirmed by the continuous experience of the writer; but

care and watchfulness are required. I have, though, to modify somewhat what was said regarding the maximum of strength and duration of current to be used. Since then, with a view to maintaining a current at any desired strength without oscillation, I have adopted a method which completely fulfils this object. It consists in using a powerful battery (80 to 100 cells) of high electro-motive force, with a high resistance introduced into the circuit, instead of the usual weak battery (10 to 15 cells) with low electro-motive force.

That is to say, as the operation is usually performed, a battery of 10 to 15 cells is used. If these be of the zinc-carbon variety (say a Leclanché battery), and supposing the resistance of the body to be 3000 ohms and neglecting the resistance of the battery, 10 cells would give a current of 5 milliampères—an unnecessarily strong current in my opinion.

By the method which I have adopted the same current may be obtained, but with many advantages. Suppose instead of 10 we use 100 chloride of silver cells (equivalent to about 70 Leclanché), and introduce by means of a rheostat a resistance of 20,000 ohms into the circuit. A current now will be obtained of 5 milliampères as before, but it will have the great advantage over the former current of being of constant strength and practically without variations, an advantage which a little consideration will show to be of inestimable value.

The strength of current is determined by the formulæ $C = \frac{E}{R}$, where E = electro-motive force of battery and R is the resistance of battery and outside circuit. Now when 10 zinc-carbon cells are used, the "current strength" $C = \frac{15}{3000} = .005$ or 5 ma.

If now, by chance, the electrode and skin have become dry, as frequently occurs during the course of a sitting, the resistance may increase to 5000 ohms or more, reducing the current to 3 ma. If again the skin becomes hyperæmic and the electrodes are freshly moistened, the resistance may be reduced from 5000 to 1000 ohms, and with this the current jumps up to 15 milliampères, a current capable of disfiguring the skin beyond repair. When, however, the second method (the one here advocated) is adopted we have an absolute safeguard against this accident. Now, as will be seen at once by reference to the formula, $C = \frac{100}{20{,}000+3000} = .0043$ or 4.3 milliampères; 20,000 ohms being the resistance of the rheostat and 3000 that of skin and electrodes.

If the resistance of the body and electrodes, for reasons just given, should diminish to 1000 ohms or increase to 5000 ohms, the current would be only increased or diminished to 4.7 and 4 ma. respectively, an insignificant variation of 0.4 ma. Even this small variation would be still further reduced, if instead of using a current of 4 to 5 ma., we

use, as is far better, a current of from 1 to 3 ma., with a rheostat resistance of from 30,000 to 100,000 ohms.

On the ground of comfort and convenience to the operator alone, the use of powerful batteries with high resistance is such an advantage that any one who has once used this mode will never give it up.

One has only to measure his current by the galvanometer before applying it to the body, regulate it to the desired strength, and then apply it with the full confidence that it will remain at a constant strength throughout the sitting whatever be the condition of the skin. —whether relatively dry or wet. One can thus measure out beforehand the exact strength of current to be used as accurately as the druggist weighs and measures the ingredients of a prescription, an advantage that must be apparent on the face of it.

The apparatus I use consists of a fifty cell Barrett chloride of silver battery (the best battery yet invented for this purpose) connected with a subsidiary carbon-zinc battery of equal electro-motive force, and in the circuit are inserted the rheostat and galvanometer. A large electrode covered with absorbent cotton serves for the application of one pole to the forearm. A chafing dish with a gas lamp at hand furnishes a constant supply of hot water for application to the face during and after the sitting. This largely prevents secondary inflammation. Before the needle is inserted the current is first regulated by the rheostat to any desired strength, the poles being put in contact outside the body, after which the electricity may be applied with confidence and without attention to the galvanometer. What would we think of a druggist who dispensed his prescriptions without scales or graduate, and merely guessed at the quantity prescribed; and yet any one who performs electrolysis without such apparatus as I have described, at least without a galvanometer, does practically this—he merely guesses at the strength of current used and often with disastrous results.

By the use of a galvanometer, alone, one can accurately measure the current, and, by breaking the circuit when oscillations in its strength occur, guard against them; but these oscillations cannot be prevented from occurring if only a few cells are used. With care, however, disfigurement can be prevented. It is in the ease and certainty with which a current can be maintained at any desired strength that batteries of high electro-motive force, combined with a high-resistance rheostat, have such an advantage.

The second cause of disfigurement is the use of currents of too long duration, but as the time element is dependent upon the strength of current employed, it cannot be governed by any apparatus, but must be left to the individual experience of the operator, who will be governed by the fineness or coarseness of the hairs and the strength of current employed. But supposing we are able accurately to measure and regulate our current, what strength of current shall we use? This is not an

easy question to answer, so much depends upon the condition present in each case. I have elsewhere stated that the strength should be not less than one-half nor more than two ma., but further experience convinces me that it is not always desirable to restrict the strength to such narrow limits, and in one respect it is probably difficult to do so, for no two galvanometers record exactly the same measurements, and a current which is given as 1 ma. by one may appear as 2 ma. on another. Furthermore, the greater the skill and experience of the operator the stronger the currents he can use with impunity. The advantage of the stronger currents is that the hairs can be removed with greater rapidity and surety. I may say I never now exceed 3 ma., as measured on my own Hirshmann galvanometer, and that only with very strong coarse hairs, and do not believe this strength should ever be exceeded. On the upper lip I never exceed 1 ma. But as much depends on the duration of the current as upon the strength, fifteen to twenty seconds being the extreme limit of duration, while three to five seconds may suffice, according to the strength of the current; but this must be determined in each case by the judgment of the operator. The operation may be compared to photography. Just as experience alone can enable a person to determine the strength of light and the time of exposure suitable in any given case, so, with electrolysis, experience alone can teach the strength and duration of currents to be used, though in both cases there are limits that should not be passed. The finer the hairs, the feebler and shorter the current that can be used; and the stouter the hairs, the stronger and longer the current required; but the weaker and shorter the current, the less liability of resulting scars.

I am free to admit that with these mild currents that I advise the liability of return of the hairs is greater than with stronger and longer continued currents, especially when the hairs are coarse. I admit that with such more hairs return than with the latter current, but a guaranty against the return of the hairs is only one and not the principal object to be sought. Those that return can be done over again. The most important desideratum is not a diminution of the percentage of the hairs that return, but *security against disfigurement*, and this can only be obtained by the employment of some such methods as I have advocated.

I also admit that there are patients to whom a small bill and time are of more importance than scars. The necessities of some compel them to accept the latter evil; to such I am in the habit of giving the choice of method, explaining that they can have the hair removed rapidly with the chance of scarring, or more slowly without such danger. I think no one will deny that a person has the right to demand that the operation be done in the best possible way, and that the opportunity be at least offered of having the chances of disfigurement reduced to a minimum, even though these be limited to "punctate cicatrices."

I cannot forego saying a word on the subject of the so-called quantity

batteries and "quantity" currents, as it is a source of much misunderstanding, even with otherwise expert medical electricians. Many writers insist upon the use of batteries arranged for quantity (that is, with large plates and small internal resistances, or connected for "surface" instead of "in series") with the idea that the current from such a battery is less painful and more efficacious. The absurdity of this proposition will be apparent to any one who reflects upon the meaning of electrical units. To compare the currents from two batteries we must, of course, compare currents of the same strength, say 1 ma. Now a current of 1 ma. means the quantity of one milliweber of electricity flowing through a given conductor in each second of time just as we would speak of the strength of the current of a stream of water being indicated by the quantity of water flowing in each second of time, as one gallon per second; or a cubic foot of gas per hour. Now to say that a milliweber of electricity per second from a "quantity battery" differs from a milliweber per second from an "intensity battery" flowing through the *same conductor*, is equivalent to saying that a current of a gallon of water per second from a large reservoir differs from a current of a gallon of water per second from a smaller reservoir placed at a greater height and flowing through the *same sized pipe*. If, as is said, the *force* or *intensity* of the stream is greater in the latter case than in the former, then, as the size of the pipe is the same, more than a gallon of water must flow per second, and in the case of the electricity more than one milliweber per second. In short, a milliampère of electricity means a given *quantity* per unit of time, and so long as you do not change that quantity the form of the battery is without effect. To say otherwise is much like saying that feathers weigh more than lead.

But there is one truth underlying this notion of quantity batteries, and this is, that a given number of cells connected "for surface," give, *when applied to the body*, a *weaker* current than the same number of cells connected "in series," consequently the pain of course is less, and those who recommend such batteries are unconsciously recommending what has been advocated here, namely, weak currents, only without the advantages of constancy.

In the preceding discussion reference has been made entirely to the use of electrolysis in removing hair; but it must be apparent that the same principles hold good for all other uses to which electrolysis may be put, when comparatively weak currents are employed. In operating upon vascular tumors of the skin, moles, nævi, strictures of the urethra, and removal of ingrowing eyelashes, the same methods should be employed. I cannot help thinking that the diverse results obtained by different experimenters in operating on urethral stricture may be accounted for by the faulty methods employed. When high currents are necessary, as in uterine fibroids, small oscillations are of no importance, and a galvanometer only is necessary.

REVIEWS.

On the Diseases of the Kidney Amenable to Surgical Treatment. By David Newman, M.D., Surgeon to the Western Infirmary, Pathologist to, and Lecturer on Pathology at, the Glasgow Royal Infirmary, etc. 8vo. pp. xv., 472. London: Longmans, Green & Co., 1888.

This is a modern book, one, indeed, which could not have been written twenty years ago, for the simple reason that at that time few of the observed facts on which it is based were known to the profession. It serves as well as any book we know to mark the changes which have occurred of late years, and is a landmark at which, while looking back upon the achievements of the science it records, one may well be filled with anticipations of what the coming art and science of surgery are soon going to be.

While originally prepared as lectures to practitioners, delivered in conjunction with others by Prof. Gairdner and Dr. Coats, they have been much enlarged and extended, until neither in length nor any other characteristic are there preserved evidences to show that the author expected to be listened to, rather than read. Thus the book has been made much more valuable and instructive, though it gains nothing in attractiveness of style. Indeed, we conceive of the book being much improved for purposes of study by its being recast into a regular and systematic treatise. This, however, is largely a matter of opinion, and we hasten to give our readers some idea of the scope and extent of this very able book in its present form.

The first lecture contains a complete study of malpositions of the kidney, once regarded as mere anatomical curiosities, but since the impetus given to renal surgery by Simon's observations, now to be classed among those which surgery may hope to benefit by one or more methods of procedure.

Dr. Newman shows the importance of distinguishing between displacement without and displacement with mobility, the latter of which alone generally gives rise to serious symptoms, or affords hope from the use of remedial measures. He also distinguishes between "movable kidney," where the organ is behind the peritoneum either in its adipose and enlarged capsule, or in a space between the peritoneum and the abdominal wall; and "floating kidney," where it moves about in the abdominal cavity, being attached, like the other organs in that cavity, to the spine by a mesentery of its own of greater or less length, or rather a mesonephron. This latter form is much more rare than the former, and its existence or clinical importance has even been denied by Lawson Tait; but there seems good reason to regard this as a somewhat bold statement, which cannot be maintained in the face of recorded observations by competent men, however extended may be the experience of any one individual.

The lecturer then goes into a careful study of "movable kidney," and shows by the observations of himself and Skorczewsky that it is much more frequent than is supposed, because it is not generally looked for, and may quite easily be unnoticed though it has a mobility of some three inches in area. It seems to be vastly more frequent in women than men, in the proportion of seven to one, and is fairly attributable to the removal of intra-abdominal pressure after pregnancy, and the consequent dragging downward of organs but poorly supported by flaccid abdominal walls. Emaciation, especially when rapid in its progress, by its removal of the inclosing fatty tissues, would seem to be another efficient cause in producing "movable kidney." The symptoms of movable kidney are often slight, but in some cases there is marked discomfort, and a congeries of symptoms which may be in part accounted for by the elongation to which the vessels are subjected. When the symptoms are severe and cannot be relieved by an elastic bandage or some contrivance to control the movements of the kidney, the remedy is nephrectomy. The statistics of this operation, while rather discouraging, yet stimulate to further trial by the steady improvement they show. Dr. Newman has tabulated thirty cases in which the operation was done for this cause, with twenty-one recoveries and nine deaths. But this operation should only be resorted to as a matter of dire necessity when nephrorrhaphy has failed.

"Floating kidney," having a distinct meso-nephron, is a very rare affection, always congenital, and, according to Dr. Newman, despite the existence of its own mesentery, the range of movement is less than in "movable kidney." Mr. Durham has described an undoubted case, but the affection is so rare as hardly to enter into a question of diagnosis, yet its existence should not be forgotten when an operation is under consideration.

Lecture II. has to do with the general symptomatology of surgical kidney diseases. "Hæmaturia," "Pyuria," "Pain and Swelling," are considered in a most thorough and exhaustive manner as to the light they throw upon diseased conditions. To go into a detailed examination of this chapter, however essential the subject may be to arriving at a correct diagnosis, would be out of place here, and transcend the limits of a brief notice like this.

The next lecture deals with "Congenital and Acquired Hydronephrosis," their physical signs, symptoms, diagnosis, and prognosis. Simple cysts, and cystic degeneration, hydatid cysts, and congenital cysts, are also considered in the same connection. To show the thoroughness with which Dr. Newman has treated his subject, we notice that he has collected and studied no less than 665 cases of acquired hydronephrosis, 448 of which were double and 217 single. When a hydronephrosis without suppuration requires surgical interference, in a few cases, as when caused by torsion or angular insertion of the ureter, tapping may be successfully resorted to; or where the trouble is an impacted calculus, manipulation gently applied over the course of the ureter may be tried, but in the majority of cases free lumbar incision, with good drainage, is the operation indicated. When the circumstances of the case demand nephrectomy it should only be resorted to after a nephrotomy, and when the other kidney is known to be healthy. Dr. Newman tabulates 21 nephrotomies and 46 nephrectomies.

Having thus considered those accumulations which are non-inflammatory in their origin, the lecturer next takes up those which are

dependent upon suppurative disease. He describes pyelitis, when inflammation of the mucous membrane of the pelvis leads to suppuration without distention of that cavity; pyonephrosis, when mechanical obstruction aids in retaining this inflammatory material; pyelonephritis, when this inflammation extends to the tissue of the kidney itself; suppurative nephritis, when the inflammation is situated in the gland tissue alone; and perinephritic abscess, when the inflammatory changes are located in the tissues around the kidneys. In connection with these suppurative affections, Dr. Newman also considers in this chapter the subject of calculus. That there is a fitness in so doing no one will question who remembers how constantly stone is at the bottom of renal suppurations, yet lithiasis is a subject so separate in its histological relations, that few would think of looking for it in a chapter treating of inflammatory affections. Dr. Newman strikes a blow at the old term diathesis, maintaining that a calculus is formed on account of a local derangement of the urinary passages, rather than as a consequence of a constitutional peculiarity of the individual. We do not dispute the pathological accuracy of the lecturer, yet we are sufficiently old fashioned to find the term a convenient one in certain cases, and one which it is rather hard to do without.

From the list we have given of its contents, it will be seen that this lecture, covering more than one hundred pages, is a most comprehensive one. It does not claim to be exhaustive, and this is especially so on the subject of calculus, but we know of no better presentation of the symptomatology of a very important, and often very perplexing class of cases than is to be found in Dr. Newman's utterances. Indeed, this chapter may very well stand for a sample of the new surgery which has had its rise within the memory of men yet in middle life, and which is so bright in promise for the future. Here also may be found tables presenting the latest information as to the results obtained by operative proceedings in cases where so generally all other treatment is merely palliative. These tables will be carefully studied by every one who desires to be thoroughly furnished and prepared to grapple with renal diseases. To analyze them would be instructive, but the new journal, to keep up with the new surgery, must limit the extent of notices of books which to be fully appreciated must be closely studied. The general treatment is also judiciously considered by our lecturer, and what he says may safely be looked upon as the latest word of our healing art upon the subject.

Passing on, we next find our author treating of "Infective New Formations in the Kidney," in which term he includes tuberculous and scrofulous disease of that organ. Injuries of the kidney and ureter are also treated of in this lecture. Cases are given and the latest attempts to remedy the conditions, so often hopeless, are fully set forth in a very satisfactory way.

The remaining lecture deals with "Renal Non-inflammatory Neoplasms" and "Operations on the Kidney." The new growths are as follows: Fibromata and fibrocystic tumors; osteomata, a very doubtful class; lipomata and fatty transformation; hæmatangiomata; adenomata; papilloma, of which Billroth narrates a unique case; carcinomata; lymphadenoma; and sarcomata.

Dr. Newman favors an early operation, so soon as the character of the growth is made out, he thinking that in this, as in so many other operations, the time of its performance is more important than the

method, provided that the latter is intelligent and skilful. The great difficulty is that by the time the growth has made such progress as to be recognized by palpation, it has often formed attachments to the neighboring parts which make its complete removal hopeless. Dr. Newman evidently favors a resort to nephrectomy in suitable cases, from his belief in the somewhat slow progress made by malignant disease when it invades the kidney, and the consequent comparatively slow rate at which adhesions are made. Indeed, the propriety of resorting to an operation at all, where the disease is a malignant tumor, can only be justified when the operator is convinced that there is a fair prospect of lengthening the patient's life and promoting his comfort by interfering. Nor can statistics, which go no further than to state the fact of the patient's death or recovery, settle this question. Such tables do show the relative mortality of a given operation; but it is necessary to study the results during a longer period, if we would have a true idea of the real value of the procedure. We may very soon be able to point to the fact that the operation has not killed the patient, and in the new and improved surgery there are comparatively few operations which are directly lethal when intelligently done; but when the proceeding has been undertaken to remedy a condition notoriously prone to recurrence, nothing should be satisfactory in the way of a result, or be thought of as a cure, which has not stood the three years' test to which the profession generally has given assent of late years. When the result of an operation is less than this it can only be regarded as a palliative measure. Dr. Newman maintains that the propriety of operating must depend upon the peculiar circumstances of the case and the opinions of the surgeons. How important are right and just opinions seen to be in the light of such a dictum. While we thus lean to an old-time conservatism, it should not be forgotten that the few true recoveries which have taken place would never have been recorded had it not been for the bold and energetic actions which have been essential to the character of the pioneer. No man dieth to himself, and in surgery, as in other things, the good of the individual is best served by that which makes for the good of the greatest number. Were it not for this, how often would the hand of the surgeon be held as he attempts to look into the future and to predicate what will be the precise result in a given case. Here it is that statistics are of the greatest value when honestly and fairly tabulated. Dr. Newman has collected 26 cases in which nephrectomy was done for cancer, in which 15 died and 11 recovered; and 36 cases in which the same operation was performed for sarcoma, of which 19 died and 17 recovered. It must not be forgotten that the recoveries were from the operation, and that of those whose history has been preserved, several are known to have succumbed to a recurrence of the disease.

The study of renal surgery has developed two sets of operations, one being as aids toward the formation of an exact diagnosis, the other for the more or less complete relief of the patient. With descriptions of these procedures Dr. Newman concludes his sixth lecture and his book.

When so grave an operation as nephrectomy is under consideration, it is of the first importance to ascertain whether both kidneys are diseased before making an attempt, which, to be successful, requires that at least one of them should be healthy. Therefore, most ingenious experiments have been made to secure the urine from one kidney unmixed with that

from the opposite side. To do this, the ureter must be catheterized, or one must be compressed while urine from the opposite side is allowed to flow unobstructed until sufficient has been collected for the purposes of examination. Several plans have been devised, and with patience and care it would seem as if one or other of these can be successfully resorted to. Dr. Newman has himself devised an ingenious apparatus by which a rubber bag can be introduced into the bladder and then filled with quicksilver, until by its weight sufficient compression is exerted upon one ureter to prevent it supplying any urine, while the now empty catheter which has conveyed the balloon will drain the bladder of the urine supplied from the other side. Of course, we have had no experience with this machine, and Dr. Newman has, but we should think it would be difficult so to direct a mass of quicksilver as large as a "hen's egg," that being the size to which the bag is to be expanded, with such accuracy as to be confident that it really occluded the mouth of the ureter. We cannot help thinking that most surgeons, when called upon to perform this difficult manipulation, will succeed better by attempting to compress the ureter between a largely curved catheter and two fingers introduced high up into the rectum. Catheterization is much more satisfactory, but while it can be generally performed successfully in females, the difficulties in the opposite sex are very much greater. Dr. Newman figures a speculum and an electric endoscope he has devised to aid in catheterizing the ureters in females, which he has found satisfactory. He has also invented catheters by which he has been able to penetrate the vesical orifices of the ureters of either side in a number of female cases, and in some cases of males. To comprehend these various forms of apparatus, our readers must turn to the book itself and the cuts it contains, as they cannot be understood from mere verbal descriptions. When samples of urine from one side alone cannot be obtained either by catheterization or compression of the ureters, aspiration can sometimes be advantageously resorted to; but, of course, neither aspiration nor exploratory nephrotomy supplies any information as to the condition of the opposite kidney, upon the healthfulness of which the success of any radical operation depends.

Nephrotomy, nephro-lithotomy, and nephrectomy are then described by our lecturer, and the indications for and mode of performing these several operations are carefully reviewed and analyzed. Carefully constructed tables, really representing the sum of our present knowledge concerning these operations, furnish invaluable aid for their proper study. We cannot follow our author into these analyses, which are themselves of the nature of a very careful and condensed review of the subject. A few words describing nephrorrhaphy, as practised to confine a movable kidney, conclude this interesting volume.

We can safely say that this book is an important and valuable contribution to surgical literature. Calm and judicious in tone, painstaking and thorough in its study of the subject, it well represents the latest knowledge possessed by the profession. We have but one suggestion to offer to its accomplished author, and that is, that in the future editions sure to be called for, the value of the book will be enhanced if the merely nominal form of lectures is forsaken, and the matter recast into a systematic and formal treatise, as we have already advised. Should our advice be taken, the book will have few if any rivals; as it is, it is worthy of the highest praise. S. A.

Der Kaiserschnitt und seine Stellung zur künstlichen Frühgeburt, Wendung, atypischen Zangenoperation, Craniotomie und zu den spontanen Geburten bei engen Becken. In 6 Beiträgen aus der K. K. Wiener Universitäts-Klinik für Geburtshilfe und Gynäkologie des Hofrathes Prof. Carl Braun von Fernwald. Herausgegeben von Dr. Egon Braun v. Fernwald und Dr. Karl A. Herzfeld. Wien, 1888.

The Cæsarean Section in its relation to Induced Premature Labor, Version, Atypical Forceps Operations, Craniotomy and Spontaneous Birth in Contracted Pelves. Being a series of six essays based upon the material of the Viennese University Clinic for Obstetrics and Gynecology, under Hofrath Professor Carl Braun. By Dr. Egon Braun and Dr. K. A. Herzfeld. Vienna, 1888.

With the appearance of Professor Leopold's book in the spring of 1888, upon the "Cæsarean section in its relation to induced premature labor, turning and perforation in contracted pelves,"[1] and the present work issued from Hofrath Carl Braun's great clinic in Vienna, scientific obstetrics seems to have received a fresh impetus. We have here the rich material collected from 20,607 labors, with careful observations made upon the 444 cases of contracted pelves included, with a description of the modes of labor, induced premature labor, turning and craniotomy, also cases of the modes of a typical forceps deliveries, as well as those of spontaneous delivery. The great interest in this work hinges upon the establishment of the proper position of the Cæsarean section relative to these alternatives, and above all in the answer to the question, "Shall the Cæsarean section be performed on a relative indication, when craniotomy will surely save the mother?"

Induced premature labor was brought on 54 times in 23,911 cases, or twice in a thousand cases, by deep puncture of the membranes, in contrast to seven times in a thousand cases in Professor Leopold's clinic, where labor was brought on by the introduction of a bougie.

All of the 54 *mothers* recovered, mostly after a normal puerperium, in contrast to a mortality of 10 per cent. in Berlin, and 2.2 per cent. in Dresden.

Of the 55 *children* (one case of twins) thus born, 7 were already dead before operation, leaving 48 living children, of which 35, or 73 per cent., were born living. Five of the survivors died within a few days after labor, so that but 62 per cent. of the children left the institute alive. The pelvic measurements show that artificial premature labor cannot yield good results in pelves contracted below 7.5 centimetres. The conclusion reached, is that induction of premature labor is not only justifiable, but a perfectly safe procedure for the mother when deep puncture of the membranes is used under full antiseptic pre-

[1] Der Kaiserchnitt und seine Stellung zur Künstlichen Frühgeburt, Wendung und Perforation bei Engem Becken. Unter Mitwirkung von Dr. L. Korn, Dr. H. Löhmann, und Dr. J. Präger. Herausgegeben von Dr. G. Leopold, K.S. Medicinalrath, Prof. der Gyn., Direktor der Königl., Frauenklinik und orden. Mitglied des Kgl. Sächs. Landes-Medicinal Collegiums in Dresden. Stuttgart Verlag, von F. Enke, 1888.

cautions. Also that there is a fair probability of saving the life of the child when the conjugata vera is not less than 7.5 cm., and the interruption of the pregnancy is not too early.

Turning and *extraction* was performed 89 times in contracted pelves, in 20,607 labors, or four times in each thousand cases, also in marked contrast to the Dresden statistics of 11.8 per thousand.

Result to *mother:* 4 women were brought already infected into the institute, of whom *one* died, another died of profound anæmia, so that 87 women left the institute alive, and the burden of responsibility upon the clinic lay at *no per cent.*, similar to the Dresden clinic.

Result to *child:* 55 children were born alive and 34 dead. In 14 cases, however, turning was employed after examination had shown the child to be no longer living, leaving 75 cases in which the child was alive; of these children, 55 were born alive and 20 dead (5 of the 20 required perforation to complete delivery).

The *pelvic* measurements in these cases show that in flat contracted pelves, even down to a conjugate diameter of 8 cm. turning yields good results for children as well as mothers. Dr. Löhman has shown by the Dresden statistics that medium-sized children could sometimes be produced living even in pelves with a conjugate of 7.5 cm. or 7 cm. In equally-generally-contracted pelves there is little probability of producing a living child in a conjugate below 8 cm. Turning is the favorite method in Braun's clinic in cases of contracted pelves.

Atypical forceps deliveries in contracted pelves. There were 78 atypical forceps cases in contracted pelves among 20,607 births, or four in each thousand cases. *Results to mothers:* 1 died of sepsis on the seventh day. 77 left the institute alive. In the forceps deliveries the following diseases were observed during the puerperium. 1 case of pneumonia, 1 of albuminuria, 2 of cystitis, 2 of separation of the symphysis; and the following infectious diseases, 9 cases of endometritis, 1 of parametritis, and 6 febrile cases. The morbidity, therefore, in relation to infectious diseases appears much higher in forceps cases than in turning or puncture of the membranes and premature labor. Results to the *children:* 90 per cent. were born living, and 10 per cent. dead. In flat contracted pelves, with a conjugata vera from 10 to 9.5 cm., all of the ten children were delivered alive. In flat contracted pelves with a conjugate from 9.4 to 9, 3 out of 16 children were born dead. Under 8.5 cm., 4 out of 5 children were dead. In flat contracted pelves with a conjugate from 8.4 to 7.5 all 8 children were born living. 1 of these last weighed 3660 grains, and was 52 cm. long. In universally-equally-contracted pelves between 9.5 and 10 cm., 50 per cent. of the children were born dead.

Craniotomy in contracted pelves. In the total number of 20,607 labors there were 56 craniotomies for contracted pelves, or 3 in every thousand cases. *Result to mothers:* 5 died; 4 of these were in a condition of septic infection when brought to the clinic, so that a burden of 1.96 per cent. falls upon the shoulders of Carl Braun's clinic, in contrast to Leopold's mortality of *nil* per cent. in Dresden, and Gusserow's of 13.9 per cent. in Berlin. *Deductions:* Craniotomy can be well carried out in pelves even as narrow as 7 cm.

Natural labor and unassisted delivery in contracted pelves was observed 163 times in 20,607 births, and of these only 3 children were born dead—that is, 1.8 per cent. dead, 98.2 per cent. living. 47

cases of spontaneous birth occurred in pelves with a conjugate diameter which was not above 8.5 centimetres. In 27 cases of flat pelves with a conjugate between 8 and 8.5 cm., 27 children were born unassisted, 25 of these were living, and but 2 dead. In generally contracted pelves of 8.5 and under, in 20 cases, 20 children were born living.

Cæsarean and Porro Cæsarean section were performed on an average of 1 case in every 187.3 births, Of 17 of these cases 7 died, or 41.2 per cent. The year 1888, however, showed marked improvement in this operation, in that in 6 cases only 1 ended fatally.

The highly conservative principles upon which the Cæsarean cases were selected, are exhibited in the fact that in the first ten cases (all Porro-Cæsarean) the conjugata vera did not exceed 6.5 cm. Case 11 in the list was performed for rupture of the uterus, and cannot therefore, strictly speaking, be either a Sänger-Cæsarean or a Porro-Cæsarean operation. The delivery in this case was effected by enlarging the tear with a knife, extraction of the child, and subsequent suture. The child was dead, but the mother recovered. Case 12 was a Sänger-Cæsarean section which died of peritonitis on the fourth day. Cases 13 and 14 were Porro operations in which the conjugate measured 55 cm., both mothers recovered, and both children were living. Cases 15, 16, and 17 were all Sänger operations, all recovered, and the children were all born living.

So much for the brief summary of this large material. Are we warranted at once in drawing any definite conclusions as to relative indication for these various operations, and, above all, can we thus determine the proper relative position of the Cæsarean section? We think not. Great as the material is, it is too much under the control and liable to the bias of one man, to enable us to rest with entire satisfaction upon the conclusions, as final. Individual differences are especially noticeable in the Cæsarean list. While our list of 17 cases gives us 2 children dead (not counting the case of rupture of the uterus) and 6 mothers died, Leopold's list of 23 cases shows all the children born alive, and but 2 mothers died, or 8, 6 per cent., or from a summary of all the cases in Leipzig and Dresden, performed by the Sänger-Cæsarean method, 33 in all, a mortality of 9 per cent.

We shall look with interest, for the appearance of a summary of the world's cases, such as has been wont to appear from time to time from Dr. Harris's pen, with especial reference to the thorough antiseptic conditions of the operation, the careful suture of the uterus by Sänger's method, and the timely aid afforded before the woman has been too long in labor. H. A. K

Diseases of the Skin: their Description, Pathology, Diagnosis, and Treatment. By H. Radcliffe Crocker, M.D. (Lond.), F.R.C.P. Lond., Physician to the Department for Diseases of the Skin in University College Hospital, etc. 8vo. pp. xxxii., 746. Philadelphia: P. Blakiston, Son & Co., 1888.

Dr. Crocker has long been favorably known as a chief figure in what one may perhaps venture to call the dermatological renaissance in England. His contributions to current literature have been numerous

and valuable, and the various sections on diseases of the skin written for Heath's *Dictionary of Surgery* exhibited a marked faculty for the presentation of facts in an orderly and comprehensible way. It may, therefore, be said at once that in the treatise before us Dr. Crocker has more than kept the promises given in his other works.

The book is gracefully dedicated to the memory of the late Dr. Tilbury Fox, for whose teaching and example the author expresses the deepest obligations.

Contrary to the usual custom in works of similar magnitude, all references to the anatomy and physiology of the skin have been omitted, although the first few pages are occupied with woodcuts, after Heitzmann and Ranvier, showing the normal structure of the integument. The omission of the explanatory text is to be regarded as commendable, since much valuable space is generally devoted to information that is already in possession of the specialist, and which the student can readily find elsewhere. We also think that the preliminary chapters on semeiology, general therapeutics, etc., could as well have been spared for the same reasons.

Dr. Crocker has had the courage of his convictions, and has refrained from inflicting a brand new classification of his own on an already overburdened profession. The scheme adopted is mainly that of Hebra, with here and there certain modifications rendered necessary by the present state of knowledge. Clinical convenience has been consulted rather than an attempt at impossible scientific accuracy.

After disposing of these prefatory considerations, the author takes up the discussion of the special pathology and therapeutics of the skin. Even in his own special field of pathological anatomy, Dr. Crocker has kept himself well in hand, and by an arrangement of the type much that would be read with profit by the physician may, temporarily at least, be passed over by the student. Occasionally, it seems to us that some subjects have received inadequate treatment on the practical side; for, after all, the end of medical learning is the cure of disease.

While hardly relevant here, still, in this day of extreme devotion to pathology, the dictum of Hebra, "Wo der Patholog und der Kliniker im Streite sind, muss der Kliniker Meister sein," should be constantly in mind. Dr. Crocker has hardly sinned at all in giving undue prominence to pathological questions, but we confess to some disappointment at the comparatively short space allotted to that most important and most frequent of all skin diseases, eczema.

The author's special views on certain dermatological questions are well known to readers of current literature, and we need only mention, among other matters, that the essential connection between scleroderma and morphœa is again brought forward. Under the rather unfortunate title of hydroa he accepts as a substantive affection the group of clinical symptoms called by Duhring dermatitis herpetiformis. Dr. Crocker avers that Tilbury Fox and Duhring were the first in recent times to give a precise signification to this disorder. We remember Fox's contributions very distinctly, and we must believe that, whether ultimately right or wrong, the credit of the generalization belongs to the American dermatologist. Dr. Crocker would still look upon impetigo herpetiformis as belonging to a class by itself.

Certain other points of interest may be briefly noted. The so-called seborrhœal eczema receives scant notice. Under the head of seborrhœa,

the author states that this condition is declared by Unna to be always inflammatory, but that, on the contrary, though often accompanied by inflammation, there are many exceptions. The same German observer's theory of the function of the sweat glands is merely mentioned without further comment.

After giving in some detail the points bearing on the relationship of lupus and tuberculosis, the conclusion drawn is that, at best, the former condition is a local tuberculosis without any tendency to generalize.

Ichthyol, as a remedial agent, is somewhat curtly dismissed, and in Dr. Crocker's estimate of the drug we must also concur. Sulphur, in teaspoonful doses in milk, twice a day, is extolled as a remedy of considerable power in hyperidrosis. Upon this recommendation we tried it in an obstinate case of sweating of the palms, and we were much delighted to find that its beneficial action had not been over-estimated. On the other hand, counter-irritation in some forms of eczema, a method of treatment introduced recently by Dr. Crocker, has not given any special results in our practice.

To give anything like a satisfactory sketch even of this important work, we should be obliged to extend this notice beyond our limits, and we shall, therefore, have to content ourselves in conclusion with a few brief remarks on its general method.

We are acquainted with few books in which the subject is so systematically handled. Every theme, with but few exceptions, is thoroughly treated, and the author has certainly mastered the happy faculty of saying much in a comparatively few words. Each disorder is considered from the standpoint of its symptomatology, diagnosis, pathology, anatomy, and therapeutics. A foot-note to most of the chapters gives a good working bibliography, in which no trustworthy reference is overlooked, and numerous other citations throughout the text bear witness to the author's wide reading. Many well-executed cuts illustrate the morbid anatomy of the diseases of the skin, and it is a notable fact that in this direction Dr. Crocker's own labors have been important and fruitful. Considerable attention is given to the maladies of the skin affecting children.

By an ingenious arrangement of bold-faced and other types the eye is attracted and emphasis laid on special points. A judicious conservatism is manifested throughout the treatise, and, at the same time, its pages discover to us the welcome truth that for the educated dermatologist the schools have lost their sway, and that at last we have all come to a very near agreement, both as to fact and expression. Indeed, we have been so favorably impressed with this valuable addition to the literature of dermatology, that we have little or nothing but hearty admiration for it, and we, therefore, take great pleasure in recommending it to the careful study of all those interested in this important branch of medical science.

W. A. H.

Zehn Fälle von Thyreotomie. Die Thyreotomie im Vergleiche mit den übrigen operativen Heilverfahren am Larynx. Von Dr. med. Franz Streiter. 8vo. pp. 125. Würzburg, 1888.

Ten Cases of Thyrotomy. Thyrotomy Compared with Other Operative Procedures in the Larynx. By Dr. Franz Streiter.

This is a strong plea for the more frequent selection of thyrotomy in preference to other procedures in the extirpation of morbid structures from the larynx. After a slight summary of the various surgical operations of the larynx, ten cases of thyrotomy from the practice of Dr. Schonborn, of Würzburg, are detailed as the theme for the plea.

Case I. was an instance of tuberculosis, diagnosed as carcinoma on the basis of ulcerative destruction of the right vocal band and the lower portion of the epiglottis, with œdematous tumefaction of the posterior wall of the larynx in a man sixty-four years of age, whose laryngeal symptoms had been of but few months' standing. The age of the patient probably led to the mistake in diagnosis, for the meagre laryngoscopic description is much more indicative of tuberculosis. The larynx was opened and the ulceration energetically cauterized with the thermocautery. The patient died twenty-two days after the operation.

Case II. was one of carcinoma in a man seventy years of age. Here the laryngoscopic description is thoroughly indicative of carcinoma; projecting thickening of the ventricular band and almost complete occlusion of the glottis by a tumor apparently beneath the vocal bands. Preliminary tracheotomy was performed, Trendelenberg's tampon canula inserted, the larynx divided with the thermocautery, and the masses cauterized. On the fifty-fourth day the patient was discharged with a moderate stenosis of the larynx and a probable carcinomatous ulceration below the vocal bands. He died about a year later from some cause unknown.

Case III. was a tumor in a man forty-five years of age. It was of the size of a hazelnut, sessile upon the inner surface of the thyroid cartilage. Thyrotomy, excision of the growth with scissors, and deep cauterization of the base with the thermocautery. The patient was doing well when discharged. Inquiry a few years later revealed that he had died in the interim of some unknown disease.

Case IV. was a case of small papilloma on the anterior half of the left vocal band of a woman forty-three years of age. The larynx was divided with the thermocautery; the growth was seized with forceps and then burnt off with the cautery—an unnecessary procedure, in the reviewer's opinion, for so slight an affection. The patient recovered thoroughly.

Case V. was a carcinoma in a man forty-one years of age. There was deep destruction in both vocal and ventricular bands, with extensive proliferations in the walls of the larynx. Cricotomy became necessary suddenly to avoid asphyxia. Thirteen days later the larynx was divided, and the parts were cauterized. A month later he went home very much reduced, and wearing his canula. No subsequent history.

Case VI., a man aged sixty-five, with carcinoma. Deep destruction of vocal bands. Thyrotomy and energetic cauterization with the hot-iron. Death the next day.

Case VII., female, aged forty-three. Agglutinative adhesion of vocal bands for a third of their extent with granulative tumor below them. Preliminary tracheotomy. Division of larynx with thermocautery eighteen days later, and energetic cauterization. Removal of canula three days later. Canula required reinsertion in six months and had to be retained until death, two months later, from pneumonia. This case reads very much like one of tuberculosis.

Case VIII., female, aged twenty-four. Tuberculosis of larynx. Preliminary tracheotomy. Thyrotomy and destruction of tuberculous masses with thermocautery. Patient discharged on eighteenth day without canula and with a good granulating wound. No subsequent history.

Case IX., male, aged forty-seven. Tuberculosis of larynx and lungs. Preliminary tracheotomy. Five days later, thyrotomy and cauterization with thermocautery. Death seventeen days later.

Case X., male, aged thirty-five. Phthisis of larynx and lungs. Preliminary tracheotomy. Twenty-seven days later, thyrotomy and energetic cauterization with thermocautery. Death one month later.

Certainly this is not a series of brilliant results. From the detailed histories of his cases the author advises that tracheotomy should always precede the thyrotomy; that eight or ten days supervene when practicable; that Trendelenberg's tampon canula should be inserted at the thyrotomy, and deep narcosis be maintained throughout the entire operation; that the soft parts should be divided down to the cartilage with the thermocautery to avoid bleeding; that extirpation of the diseased tissues should be followed by energetic cauterization with the hot iron; that sutures may be introduced superficially when the hot iron has not been used, or has been used but slightly, but that the wound must be kept open when cauterization has been used extensively, and that in the great majority of cases it is much better to use no sutures at all; and, finally, that the tampon canula should be retained in position for several hours after the operation, or until the morning following.

These points are well supported by argumentative dissertation. The reviewer has had no experience with the incandescent knife in dividing the soft tissues or the larynx itself; and he cannot comprehend the necessity for such a procedure in preference to the bistoury when the trachea is protected from blood by a tamponed canula, a precaution which affords every facility for careful operation and for deliberate arrest of undue hemorrhage. He cannot believe, either, that thyrotomy and cauterization present any advantage in tuberculosis over tracheotomy when necessary to avert impending asphyxia, and intralaryngeal treatment afterward. On the contrary, his opinion that the fatal issue is accelerated by such procedures is only too evidently supported by the histories in this series.

That the dangers from thyrotomy have been over-estimated by some writers, as is urged by the author, is only too true; but the inference that thyrotomy is the better and safer procedure in all benign growths except those most easily accessible, as is also urged, is illogical. Intralaryngeal operations have their limit; but that they are to be superseded by thyrotomy as the rule in the surgical treatment of benign growths or of tuberculosis, or even of stenoses, is opposed to the experience of those who are familiar with both procedures. It cannot be too strongly impressed upon the general surgeon that under ordinary circumstances he has no right to submit his patient to thyrotomy in a case any way doubt-

ful unless his opinion as to its necessity has been endorsed by some one thoroughly conversant with the resources of intralaryngeal methods of extirpation. The author's arguments to the contrary are largely beggings of the question. The surgeon who consults the permanent good of his patient in preference to relying implicitly upon his unassisted judgment will never make such a mistake; and it is usually the surgeons of most repute who are most desirous of avoiding unnecessary mutilation of their patients. In reference to malignant growths, however, matters are reversed; and the reviewer can fully endorse the opinions of the author. It is very rarely, and only under exceptional conditions, if not only under fortuitous circumstances, that endolaryngeal procedure is crowned with success in the treatment of malignant growths. The intelligent laryngoscopist will quickly submit malignant growths to direct surgical access. The ignorant one will temporize, and thus counterbalance the unintelligent surgeon who ignores the resources of laryngoscopic interference.

The reviewer believes with the author that when the diagnosis of malignancy has been made early enough, thyrotomy and thorough extirpation of the morbid mass will often be practicable, and will afford as much immunity from recurrence as partial or complete laryngectomy. The direction of study, therefore, should be as fully in the domain of diagnosis as in that of operative technics, and here the services of the skilled laryngoscopist are invaluable. The reviewer could testify to cases mistaken for chronic laryngitis which are revealed to be carcinoma under better illumination, and to cases mistaken for carcinoma which have been revealed as tuberculosis or as syphilis. Several instances are on record in which the tuberculous larynx has been extirpated under the opinion that it was carcinomatous.

In addition to the points mentioned, the author indicates the various diseases which may call for thyrotomy; and he discusses at length the statistics of several writers upon that operation, upon endolaryngeal operations, and upon partial and complete laryngectomy; and compares their several advantages and disadvantages. J. S. C.

On the Relief of Excessive and Dangerous Tympanites by Puncture of the Abdomen. A Memoir. By John W. Ogle, M.A., M.D. Oxon., F.S.A., Consulting Physician to St. George's Hospital; Fellow (late Vice-President) of the Royal College of Physicians of London; late Vice-President of the Royal Medical and Chirurgical Society, and of the Pathological and Clinical Societies of London, etc. 8vo. pp. 111. London: J. & A. Churchill, 1888.

It must strike one as very remarkable that such a subject as that which forms the text of the present monograph, though known, advised, and practised from times of utmost medical antiquity, has never, until now, received systematic elaboration. But for this unaccountable delay and oversight we are well rewarded by the appearance of this thorough and scholarly work from the distinguished and valued pen of Dr. Ogle.

In it he has collected all references to be found in medical history

regarding the operative relief of excessive tympanites by puncture of the abdomen, and to this erudite assemblage the author has added his own criticisms and clinical observations; expressing great confidence in the measure and urging its employment in certain well-marked classes of cases.

More than one-half of the entire work is apportioned to a most valuable summary of current British medical opinion concerning the procedure which Dr. Ogle has acquired by a vast epistolary correspondence, in the main approbatory, and containing incidentally innumerable records of cases, clinical suggestions and experiences.

The book is a complete record of existing knowledge of the subject, and will be found to contain all materials with which to form a judgment of the benefits and dangers, merits and demerits of this unsettled question. T. S. K. M.

Gonorrhœal Infection in Women. By William Japp Sinclair, M.A., M.D. 8vo. pp. 143. London: H. K. Lewis, 1888.

This brochure contains a concise review of the recent literature of the subject, to which are added the conclusions drawn from the writer's somewhat extended clinical studies. He agrees with the modern theory of gonorrhœa as being a disease produced by a specific germ which may be recognized with comparative ease. Gonorrhœa may be latent in men and women, the gonococcus remaining in the recesses of the genital canal, and being excited to virulence by the congestion incident to coition or menstruation.

The result of gonorrhœal infection in the female is inflammation, producing sterility through occlusion of the Fallopian tubes, and threatened septicæmia from pyosalpinx. While not an alarmist on this point, Sinclair is convinced of the frequency and serious character of gonorrhœal inflammations.

The treatment of gonorrhœa in women which the writer has found most effective is the intra-uterine injection of tincture of iodine, accompanied and followed by vaginal injections of dilute mercurial solutions. When the tubes and pelvic peritoneum are involved, perfect rest and warm vaginal injections are indicated until the gonorrhœal virus has exhausted its invasive activity; resection of the tubes is to be undertaken when pronounced symptoms of septicæmia arise.

To ascertain whether the gonococcus is latent in a man who has had gonorrhœa, Sinclair practises the urethral injection of a mild irritant; if the gonococcus is found in the slight discharge thus caused, the individual is capable of infecting another.

The book is a useful summary of our knowledge of the subject up to the present, and is written, not from the standpoint of an alarmist, but with the conservative judgment of an experienced clinical observer.

E. P. D.

PROGRESS

OF

MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

FRANCIS H. WILLIAMS, M.D.,

ASSISTANT PROFESSOR OF THERAPEUTICS IN HARVARD UNIVERSITY.

Chloroform as an Internal Remedy.

Dr. Stepp, of Nüremberg, noting the observations of Salkowski on the disinfecting power of chloroform water, determined to make trial of chloroform internally in a considerable number of diseases. In gastric ulcer, Dr. Stepp gave chloroform (fifteen grains in a five-ounce bismuth mixture) with great effect, and believes this to be due to its disinfecting, astringent, and stimulating properties. In various affections of the mouth and throat, as follicular pharyngitis, catarrh of the pharynx, gingivitis, and diphtheria, washes and gargles containing chloroform proved very beneficial.—*Lancet*, March 9, 1889.

Prof. Bianchi recommends chloroform water instead of alkaline solutions in washing out the stomach.—*Deutsche medicinische Wochenschrift*, February 7, 1889.

Sparteine.

A physiological and clinical study of the action of sulphate of sparteine, by Dr. Gluzinski, brings him to the conclusion that this drug has, unquestionably, a good effect in cardiac cases when compensation is incomplete, and that its action is apparent soon after the administration of the drug. The rapidity of its action is the most important characteristic of this drug; in strength it is far behind digitalis, and is not to be compared with it. Arythmia is not corrected by it.—*Deutsche Archiv für klinische Medicin*, March 14, 1889.

Some Therapeutic Uses of Water.

Among the applications of water to several conditions frequently met in practice, as suggested by Dr. Simon Baruch, are the following:

Very hot water, as a styptic and a preventive of shock, should be more

widely recognized. The hot douches used in gynecology to remove inflammation, is another important use of hot water. The directions of Dr. Emmet, such as to have the patient in a reclining posture, the temperature of the water not far from 110° F., the stream intermittent, and applied by a nurse, should be carefully followed.

In certain skin diseases, of which eczema is a type, it is contra-indicated; cures sometimes follow simply from avoidance of water. A similar beneficial change in our ideas had led to the dry boric acid packing in suppurative otitis media in place of frequent injections of water.

Half a pint of hot water slowly sipped an hour before meals had been found, by actual examination, to cleanse the stomach of mucus. An occasional washing of the stomach, five hours after eating, much increased the benefit to be gained by sipping the water.—*New York Medical Journal*, March 16, 1889.

The Use of Expectorants.

When a cough of the expectorating variety is difficult, on account of the viscidity of the phlegm, the administration of an oil sometimes greatly lessens this difficulty. Dr. W. H. Thompson, in a paper read before the Medical Society of the County of New York, recommends for this purpose raw linseed oil, given in an emulsion. He has found that it relieved bronchial asthma, and asthma in those much affected by changes in the weather; also, congestive bronchitis, the bronchitis of heart disease, and senile bronchitis.

The following formula is given:

Linseed oil	℥xv.
Oil of wintergreen Oil of cinnamon	āā ℥ij.
Glycerine	℥v.
Simple syrup	℥x.
Water	℥xxiv.

Made into an emulsion.

Dilute hydrocyanic acid	℥ijss.
Magendie's solution	♏xl.

Or, chloral ℥jss might be added in suitable cases.

In the discussion which followed, Dr. Jacobi suggested the sipping of water or Vichy, to relieve cough caused by pharyngitis.

Dr. Simon Baruch thought a sufficient search was rarely made for the real causes of cough. The so-called expectorant drugs were given more as a fashion than from experience. Rossbach had shown that squills, ipecac, and other agents of a similar kind so often given for coughs, were really without any expectorant effect, and that only apomorphine had such an action.

Dr. Darlington testified to good results which he had, for some years past, seen in bronchial coughs, from doses of pure linseed oil.—*New York Medical Journal*, February 9, 1889.

Antidote for Morphine.

Prof. Bokai believes that the best antidote for morphine is picrotoxin. The two substances act in an antagonistic manner on the respiratory centre, mor-

phine paralyzing its action, while small doses of picrotoxin increase it. As, in poisoning by morphine, death occurs from paralysis of the respiratory centre, and as picrotoxin hinders this paralysis, it follows that picrotoxin is likely to be of real use in morphine poisoning.

In this form of poisoning, diminution of the blood pressure plays an important part, but picrotoxin enjoys the property of stimulating the vaso-motor centre of the medulla, and thus counteracts the effect of the morphine. The action of these two substances on the cerebral hemisphere, is also of an opposite character.

It is also suggested that picrotoxin may be useful as a substitute for preparations of nux vomica, and that it will be found useful in preventing chloroform asphyxia.—*Lancet*, March 9, 1889.

A New Remedy for Cholera.

Loewenthal (*Acad. des Sciences*, Session Dec. 1888) has concluded a course of experiments undertaken to find an antidote to the virus of cholera. This toxic principle is now, according to the newest pathology, regarded as the product of Koch's cholera bacillus—a ptomaine, in fact, which is destroyed by cultivation in artificial nutrient media.

Loewenthal has found that a pure culture of these cholera bacilli in peptonized broth previously sterilized, is absolutely inoffensive to animals—as white mice—naturally susceptible to the cholera poison; the bacilli ceasing to produce the noxious ptomaine.

The first aim of Loewenthal's experiment was to render to the cholera bacillus, by a process of the laboratory, the toxic property which it possesses when fresh, but which is lost on cultivation. After many fruitless essays, he believes that he has succeeded with a paste which contains pancreatin, and the composition of which is as follows: Fresh pork (muscle), hashed, 16 ounces; pancreas of hog, hashed, 6½ ounces; bean flour, 3½ ounces; peptone, ½ ounce; grape sugar, 2½ drachms; common salt, 1¼ drachms.

These substances, mixed with water or milk, give a soft paste, almost liquid, which is rendered alkaline by a little potash, and then sterilized by hot steam. The cholera bacilli, which by culture have lost their pathogenic properties, are allowed to breed in this artificial paste.

They immediately secrete their virulent ptomaine, which, when inoculated in mice, either kills these animals or makes them intensely sick.

By varying the elements of his culture mixture, Loewenthal finally satisfied himself that it is the pancreatic juice which, in presence of albuminoid and peptonized substances, determines the pathogenic or poison-secreting action of the bacillus.

All the other culture media (peptone-gelatine, agar-agar, bouillon) assure the development of the bacillus, but no toxic matter is produced.

The peculiar action of the pancreatic juice being understood, we have, says Loewenthal, an explanation of the phenomena of cholera in man. The bacilli, after being ingested, escape the stomach, and entering the intestine, produce there, with the help of the pancreatic juice, the same toxic matter which is produced in the pancreatic paste, the latter being a coarse imitation of the contents of the duodenum; this toxic matter is absorbed and the re-

storation or death of the patient depends on the quantity of poison absorbed and the resistance of the organism. This experimental fact is in harmony with the anatomo-pathological fact that the bacilli of cholera remain always confined to the intestine, as well as with the "fulminant cases," and the experiments of Nicoti and Reitsch, and those of Koch on animals.

This point being once determined, Loewenthal asked himself if there might not be some substance inoffensive to man which, introduced medicinally, would prevent the development of the cholera poison in the intestine. To determine this, he first experimented with his pancreatic paste, trying various antiseptic agents which he thought might prevent the active functional operations of the bacilli and the genesis of the toxic ptomaine. Any agent, he reasoned, which can accomplish this out of the body might be relied upon to do the same within the body and thus become a specific (preventive and curative) remedy for cholera.

This remedy, Dr. Loewenthal announces, he has found in salol, the salicylate of phenol, discovered in 1886 by Nencki, of Berne. This powerful antiseptic is decomposed in the organism by the pancreatic juice, the same agent which renders toxic the cultures of the cholera bacillus in the pancreatic paste. A multitude of experiments have assured him that salol in the presence of fresh pancreatic juice is invariably fatal to the cholera bacilli in his laboratory culture-tubes; and he has determined the quantity which is sure to sterilize his cultures effectually, namely, one-half drachm of salol to every two and a half drachms of the paste; a smaller dose, however (as one and a half grains), renders the bacilli inactive.

It is known that salol can be taken in pretty large doses (as much as two and a half to four drachms a day) by man with comparative impunity.

It must be added that the above interesting laboratory experiments, conclusive as they seem to be to their author, who has full faith that he has now found a sure specific for cholera, still lack clinical confirmation, as well as that confirmation which comes from a series of carefully conducted experiments on animals.—*Boston Medical and Surgical Journal*, Feb. 7, 1889.

Antipyrin in Sciatica.

The patient had been confined to his bed for two months, and was unable to move his left leg. The hip-joint was so painful that the gentlest examination with the fingers could scarcely be borne. The slightest pressure over the gluteal, sciatic, and trochanteric regions made the patient cry out with pain. Sleep had been impossible for some nights.

Injections of morphine, anodyne applications, salicylate of soda, iodide of potassium, sulphate of quinine, tincture of gelsemium, bromide of potassium were all tried, without the least effect. Tonic treatment with iodide of iron, cod-liver oil, etc., proved equally futile.

Antipyrin was given in doses of seven grains with an equal quantity of quinine three times a day. The day after this treatment was begun the patient wished to get up and could move the affected limb quite freely. Ten days afterward he left the hospital, completely cured and having gained considerably in weight.—*British Medical Journal*, March 16, 1889.

Balsam of Peru in Ozæna.

Prof. Rosenbach has found Peruvian balsam an excellent disinfectant in a series of cases which had resisted the usual deodorizing agents. It should be applied daily, by means of a brush, to the mucous membrane at the entrance of the nasal cavities and by means of a tampon soaked in the liquid to the deeper portions.—*Deutsche medicinische Wochenschrift*, Feb. 7, 1889.

Hydrofluoric Acid Treatment of Phthisis.

In the January number of this journal an account was given of seventeen cases of phthisis treated by inhalations of hydrofluoric acid where good results were obtained. Five cases have been since reported before the Buda-Pesth Medical Society, where the results were not satisfactory.

In these cases care was undertaken to eliminate, as far as possible, the disturbing influence of climate by selecting only patients who had been for some time in Göbersdorf, where the investigation was carried out. Again, all five cases treated were in a tolerably stationary condition, but none were taken in which tubercle bacilli were not distinctly present in the sputa.

Altogether, each patient was given from forty to fifty inhalations. At first only fifty litres (quarts) of impregnated air per patient were admitted into the room during the sitting of an hour's duration. The amount was gradually increased until, during later sittings, as much as five or six hundred litres per patient were admitted.

The subjective sensations seem to have been very disagreeable, for all the patients complained of a smarting sensation in the eyes, the nose, the pharynx, and the chest, which last is described as a somewhat severe pain. The cough and the expectoration also increased, and in more than one case hemorrhages occurred. Again, all the patients complained of headache and loss of sleep. The physical results were as follows: In every case the bacilli increased and the condition of the lungs became worse; in four cases the body weight decreased from one to six pounds, increasing only one pound in one case, where, however, the other symptoms had undergone a change for the worse; in three cases the exacerbations of temperature increased to a very marked extent; in four cases the vital capacity diminished, and in the remaining case, though it increased a little, the infiltration of the lung augmented very decidedly.

From the above it would appear that so far from exercising any beneficial influence on the course of the disease, the inhalation of hydrofluoric acid proved hurtful in every one of the five cases in which it was tried.—*Lancet*, March 9, 1889.

Pilocarpine in the Itching of Jaundice.

It occurred to Dr. Goodhart that a drug which so uniformly was productive of speedy diaphoresis must profoundly modify the functions of the skin for the time being, and might in doing so relieve the itching in a patient with jaundice, which had hitherto defied treatment at his hands. One-third of a grain of pilocarpine did so quite beyond his expectation and kept the patient comfortable until she died. In the next case it was equally successful. The

patient had one-third of a grain injected subcutaneously many times, and always with this result, that the first twenty-four hours he was quite free, the second he was fairly free, and the third day he was getting bad again, and the dose had to be repeated.

It was used without failure in six cases.—*British Medical Journal*, January 19, 1889.

MEDICINE.

UNDER THE CHARGE OF

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Cupping-glasses as Diagnostic and Therapeutic Means.

George White (*Med. Record*, January 26, 1889, 92) has for several years made extensive use of cupping-glasses for diagnostic purposes in the localization of diseased areas. He claims that the greater the congestion is at the point of contact, the greater the cutaneous coloration; and says that he has often been able to outline accurately a congested area of deeply lying tissue in this way. A number of cases are cited by way of illustration. As a therapeutic agent, too, the cupping has often proved of the greatest value in his hands.

New Method of Treatment of Tubercular Processes.

Landerer (quoted in *Les Nouveaux Remèdes*, No. 1, 1889) says that in the thorough treatment of tuberculosis, two different methods can be followed: 1, either find a specific (like mercury in syphilis and quinine in malaria), a thing which no one has as yet succeeded in doing; or, 2, imitate nature, and endeavor by an inflammatory process to transform the tuberculous focus into a solid cicatrix. That this method of cure is rare, is due to the fact that tubercle is too poorly supplied with bloodvessels and with material for reparative change to undergo the process of cicatrization. The curative action of inflammation is well seen in the amelioration, or even temporary recovery of lupus after an attack of erysipelas.

The author, in seeking to excite an aseptic inflammation by chemical means, has made use of balsam of Peru, which was recommended long ago by Sayre. Tuberculous ulcers, fistulas, etc., heal under the influence of an ointment composed of 1 part of balsam of Peru, 3–5 parts of diachylon ointment, and 1½ parts of wax. Balsam of Peru may also be introduced hypodermatically into peripheral tubercular foci, if it is prepared according to the following formula: Balsam of Peru, mucilage of acacia, āā 15 grains; olive oil, q. s. to

make a very fine emulsion; chloride of sodium, 11 grains; distilled water, 3½ ounces. The medicine is, however, not diffusible, and will not in this way reach foci removed from the seat of injection. Tubercular foci in the interior of the body are due to microbic emboli from the seat of the primary lesion. The author, therefore, proposes to bring the medicine in contact with them by means of intra-venous injection. An objection presents itself; that the particles of balsam might produce inflammation in healthy tissue, instead of attacking the diseased regions. Experience has shown, however, that corpuscular elements introduced into the blood are arrested preferably at those points where there has been a previous inflammation. It can be presumed, then, that the particles of the balsam, provided they are not larger than a leucocyte, will pass into the tissues affected by tuberculosis. Experiments on animals showed that in the cases where an injection of tubercular matter had been followed after some weeks by one of the Peru emulsion, the tubercular foci in the lungs, liver, and spleen were surrounded by an areola of inflammation, and even by a ring of connective tissue in advanced cases. The tubercular masses were dry, as though calcareous, and contained very few bacilli. The masses had, in fact, the appearance as though about to heal by cicatrization.

The author has treated fifty-one cases of tuberculosis with the Peru balsam. In the local affection the ethereal solution was applied, or subcutaneous injections used with satisfactory, and sometimes with remarkable results. The best results were obtained in fungous affections of the articulations. There were only four cases of pulmonary tuberculosis in which intra-venous injections were given, and though the treatment was well borne the results were not brilliant. For intra-venous injections the author prepares a fresh emulsion each time, making it slightly alkaline with potash. The injection is always followed by a sensation of lassitude and depression, especially in the evening. He cautions against the use of this method in advanced pulmonary infiltration, as the inflammation which it might provoke would dangerously diminish the air space.

The Local Treatment of Diphtheria with Salicylic Acid.

A. D'Espine (*Rev. Méd. de la Suisse Romande*, No. 1, 1889) takes the ground that diphtheria is at the onset a local affection, and that the general symptoms arise later from the absorption of matters produced at the seat of disease; the microbes *not* being absorbed in the blood. Reasoning on these premises, he makes several propositions regarding treatment, which may be summed up as follows:

1. Internal parasiticides, such as mercury, are useless, and only add a medicamentous intoxication to the diphtheritic. All debilitating medication should be proscribed (such as chlorate of potash in large doses, antipyrine, apomorphia, pilocarpine, etc.), and the general treatment be purely of a tonic nature; the sole indication for internal treatment consisting in sustaining the forces of the patient.

2. The sooner local treatment is commenced, the greater will be the chances of preventing the general infection. An early diagnosis is, therefore, of the greatest importance. To aid in this he advises that a portion of the white deposit be removed when it first appears, dried on a cover-glass, stained with

fuchsin or gentian violet, and examined for the bacilli of Löffler. These are of the shape of a little, curved sausage, and may usually be easily distinguished from others present. They are about the length of tubercle bacilli, but two or three times their thickness. They are best found early in the case, being difficult to discover later on account of the numbers of other growths, and the large amount of fibrin in the false membrane. At this stage, however, the diagnosis has become evident. In cases of doubt in the early stages, it is better to mistake a simple angina for a case of diphtheria, than to make the contrary mistake.

3. The local parasiticide employed should be efficient against the bacillus of Löffler. It should be used in sufficient quantity and often enough to sterilize the false membrane. For this purpose, he employs salicylic acid in a dilution of $1\frac{1}{2}$–2 in 1000. Chlorate of potash, benzoate of soda, and boric acid may be struck from the list of topical agents useful in the treatment of diphtheria.

4. Carbolic acid, sublimate, and all other agents should be avoided, which, used in strength necessary to sterilize the false membrane, are capable of producing an intoxication.

5. In applying the parasiticide, it is necessary to avoid all procedures which may open new doors of entrance to the virus by denuding the epithelium, or which may increase the fibrinous exudation by irritating the submucous tissues.

6. The effort should be made to reach all the diphtheritic surfaces with the parasiticide.

The author recommends that the solution spoken of be used by irrigation every hour or two hours, depending on the gravity of the case. In quite young children, where a considerable quantity of the solution is swallowed, it is well to make it of a strength of 1 in 1000 or 1500. He has seen excellent results follow this treatment. In cases in which the false membrane has become quite thick before the treatment was instituted, irrigation is not sufficient to sterilize it completely. In addition to it, it would then be well to use swabbing with some agent which will soften and disintegrate the deposit, and for this purpose he knows of nothing better than lemon juice. Chloral or papain may be employed for the same purpose. The great advantage of salicylic acid is, that it is an excellent parasiticide of the bacillus of Löffler, even in the strength of 1 in 2000; and that it can be employed in large amount without fear. The author quotes, finally, from the writings of several authorities, to show that he is upheld in his favorable estimation of the drug for the treatment of this disease.

The Treatment of Diphtheria with a Spray of Hydronaphthal, Papain, and Hydrochloric Acid.

W. C. Caldwell (*Archiv. of Pediatr.*, February, 1889, 97) makes the two propositions: 1. That diphtheria is at first a local sepsis, and that the temperature is due to the absorption of leucomaines, but that it is probable that later the microbe of septicæmia, and possibly of diphtheria, may enter the blood and produce a general disease. 2. That it is probable that the pseudo-membrane is over the site of the local, primary infection, and that the bacteria

are invading the lymph spaces of the submucous tissue beneath it. The indications for treatment, therefore, are the prompt, frequent, and effective application of drugs which will remove the membrane, and thus reach and arrest the growth of the bacteria. For convenience, he prescribes these drugs in the same mixture. They must, however, be such as do not antagonize each other, or in any way be incompatible. Thus, pancreatin is an active peptonizer, but can only be used in an alkaline medium; while bichloride of mercury is a powerful antiparasiticide, but also neutralizes to a certain extent the peptonizing ferment. After considerable clinical experiment he adopted the following method of treatment, which he reports in seven cases: 1. Keeping the bowels open. 2. Ingestion of two to six ounces of milk every two hours. 3. Spraying the throat with the following prescription: Papain, ʒij; hydronaphthal, grs. iij; acidi hydrochlorici dil., gtt. xv; aq. destil., ad. ℥iv. By adding ʒiv of glycerine to the mixture, its solubility is greatly increased. Hydronaphthal is a powerful antiseptic, which acts either in a neutral or acid medium, and is not poisonous. The throat should be sprayed every half hour until the temperature falls; then every hour, unless the patient be asleep. In the cases reported, the temperature fell in from four to eight hours. It is very important to apply the spray thoroughly, which is not an easy matter. Three persons are required—one to hold the child's head, one to depress the base of the tongue, and the third to use the hand atomizer rapidly for a few seconds. The child is then given a little rest, and this procedure repeated several times. The thorough depression of the tongue is an essential feature. The author admits that the treatment is best adapted to the early stages before the disease has become constitutional, and thinks it probable that in a later stage there would be danger from heart failure, or from too great exhaustion from the force required in carrying out the treatment.

Sulphonal in Insomnia.

W. L. Worcester (*Journ. Amer. Med. Assoc.*, March 9, 1889) has administered sulphonal to 17 insane patients. Twenty grains was the maximum dose, except in one instance in which this amount was administered 3 times in the course of one night, and failed to produce any perceptible effect. With this exception 20 grains did not fail in any instance to produce sleep, lasting usually from 5 to 8 hours. No undesirable effects were noticed on the circulation, appetite, digestion, or general condition of the patient in any instance. In one case the administration was continued for 36 days, and in another for 23 days. In neither of these was it necessary to increase the dose, but the medicine appeared rather to be more effective during the later part of the treatment than in the earlier period.

E. H. Kisch (*Berlin. klin. Wochenschr.*, 1889, No. 7, 128) reports the results of his administration of sulphonal in 24 cases. The most favorable action was seen in 12 nervous individuals suffering from insomnia, the result of various conditions of excitement. In these a dose of from 7 to 15 grains was sufficient, after one-half to two and one-half hours, to produce sleep, lasting through all, or the greater part, of the night. Three other individuals were also favorably influenced by the drug, making 62.5 per cent. successes in all. He admits that the psychic influence of the administration of a hypnotic

must be taken into account in many of these cases. In 6 cases there was no hypnotic action obtained even in doses of 30 grains. In 3 cases—*i. e.*, 12.5 per cent.—unpleasant effects were observed. One of these patients was suffering from hemiplegia, the result of an apoplectic stroke, which had occurred a short time before. Morphia had proved valueless in producing sleep, but 15 grains of sulphonal were followed by sleep lasting the entire night. On the next morning, however, the patient was completely aphasic, and this condition gradually disappeared only after 8 to 10 hours, the patient meanwhile feeling very weak. The second patient, after taking 45 grains in divided doses during the night, felt wretched and exceedingly weak on the following morning, and complained of a feeling of great depression and as though the senses were leaving him. The pulse was also retarded, beating only 38 in the minute, and this symptom disappeared only after several hours, and after the use of stimulants. The third patient, a man of sixty-two years of age, had often used morphia and chloral for sleep without effect. After 1 gramme of sulphonal deep sleep came on, lasting the whole night. On the next day, however, the patient was horrified to find that he had had a nocturnal seminal emission, the first for over ten years. He also felt sleepy the whole day, as though stupefied, and could not get up.

Acromegalia.

Broca (*Archiv. gén. de Méd.*, December, 1888) describes at great length the skeleton of the second case of acromegalia described by Marié. He sums this up by saying that there was a hypertrophy of the spongy portion of the bones of the limbs and trunk, with an increase of their porosity. The articular portion participated but little in the changes. The insertions of the tendons and ligaments were nearly all very prominent, the diaphyses were elongated, and the grooves for the arteries very large. The bodies of the lumbar vertebræ showed a tendency to a hypertrophy of the spongy portion. There was a cyphoscoliosis in the dorsal region, the scoliotic convexity being toward the left. The clinical history of this case stated that there was a hyperostosis, affecting especially the malar and inferior maxillary bones. The study of the skeleton showed that this was an error, as the malar bone was not involved, and there was no hyperostosis. The superior maxilla was massive. The face was distended by a bulging of the maxillary sinus; in fact all the sinuses of the bones of the cranium were greatly dilated. The inferior maxilla exhibited in a high degree the characteristic deformity.

Chorea.

W. P. Herringham (*Brit. Med. Journ.*, January 12, 1889, 75) has made a study of the antecedents, family history, state of the heart, and subsequent history of 80 cases of chorea. An antecedent history of rheumatism could be traced in 37 cases. Injury, shock, or a violent burst of emotion preceded the attack in 6 cases, the interval being never longer than two days. Hard mental work or worry was found in 20 cases. In 25 cases none of these causes could be traced, and 14 of these were instances of first attacks. Nearly all the patients were delicate, and headache and indigestion were common. The study of the family history (calculated from parents, brothers, and sisters

only) showed that rheumatic fever had occurred in 25 out of the 75 families, and that 17 of these belonged to 34 patients, themselves of the rheumatic class. Chorea had occurred in 12 families, 9 of whom were also rheumatic. The heart was normal in 10 cases, possibly diseased in 25, and certainly so in 20. Signs of cardiac disease developed during observation in 11 cases, and signs which were at first present vanished under observation in 4 cases. After an interval of 2 years or more 5 of these 11 cases were re-examined, and of these the hearts of 2 were normal, while in 3 that organ gave clear signs of disease. Of the 25 cases whose hearts were possibly diseased, 2 had become healthy, and 7 appeared certainly affected. The author concludes: 1. That a large number of choreic patients are liable to rheumatism. 2. That choreic patients are nearly always of a delicate constitution. 3. That chorea is sometimes directly caused by emotion. 4. That chorea might cause permanent heart disease. 5. That it also gives rise to signs of heart disease which are not permanent.

A. E. Garrod (*ibid.*) has studied the relation of chorea to rheumatism, basing his observations on 80 cases of chorea, 49 of whom were suffering from first attacks. There was a history of rheumatism in the families of 32 patients, and it is to be noted that the tendency to chorea was far more marked in some of these rheumatic families than in others. The number of cases in which there had been manifestations of rheumatism other than endocarditis was 36. There were cases which had had no family or personal history of any manifestation of rheumatism, and which yet were proved to be of rheumatic origin. Such were rheumatic patients who had previously suffered from chorea, or those in which erythema nodosum and arthritis developed in the course of an apparently non-rheumatic chorea, or where chorea was associated with pericarditis or with endocarditis and nodules without joint pains. In 15 cases the onset was ascribed to fright, but inquiry showed that in some of these the fright followed the development of the chorea. In 45 cases a definite heart-murmur was heard, and in 6 others the first sound was "murmurish." In some instances the murmurs developed under observation. The author is of the opinion that the endocarditis of chorea is probably always of rheumatic origin, but there is no ground to believe that chorea itself is always of rheumatic origin, a considerable number of cases being probably due to emotional and other causes.

The Treatment of Friedreich's Ataxia by Suspension.

P. Blocq (*Rev. gén. de Clin. et de Méd.*, February 14, 105) describes the method of treatment of locomotor ataxia by suspension, and the cause of its discovery by Motchoukowsky. He also speaks of the great success which the method has attained in the hands of Charcot, and finally reports the improvement which has taken place in one of his own cases of Friedreich's ataxia. This case he reported in May, 1888, in *France Médicale.* In February of that year the patient, a girl of sixteen years, exhibited scoliosis with the convexity to the left, scanning speech, ataxia of the head, and nystagmus. There was manifest ataxia of the upper extremities, and she was unable to carry a spoon to the mouth when the eyes were shut, or to touch the finger to the nose; could not learn to play the piano, and her handwriting was very wavering. The inferior extremities exhibited talipes equino-varus. There was incoördina-

tion of voluntary movements, and particularly of the gait, the feet being thrown out sidewise, the heels striking the ground and the legs entangling each other. She could not hold herself upright when the eyes were shut, and was unable to stoop. The tendon reflexes were abolished, and there was amenorrhœa.

In October, 1888, treatment by suspension was commenced, the patient being suspended for one-half to three minutes two or three times a week. Improvement, especially in the gait, was apparent by the second week. When examined in February, 1889, her state was as follows: Scoliosis concealed by a plaster jacket; static ataxia of the head more marked; nystagmus and scanning speech unchanged. There was very little incoördination of the upper limbs, and the patient was able to carry her finger to her nose, a spoon to her mouth, to take lessons on the piano, and to write steadily. The talipes remained the same, but the incoördination of gait was surprisingly improved. She could hold herself upright with her eyes shut, and was able to stoop. The tendon reflexes were still absent, but her menses had been regular for two months. As Charcot remarked with reference to this case, these results are certainly worthy of consideration in an affection which always gets slowly and steadily worse, and always ends fatally.

Aneurism of an Anomalous Artery causing Antero-posterior Division of the Optic Chiasm, and producing Bitemporal Hemianopsia.

S. Weir Mitchell (*Journ. Nerv. and Ment. Diseases*, January, 1889) reports the following interesting case of this condition: The patient, a large, healthy-looking man, of forty-three years, had for a year complained of varying but gradually increasing pain in the parietal and vertex regions, which at times darted through one or both temples. Excessive exertion would increase it or bring it on. He had also recently felt easily fatigued, and the legs and arms became easily numb when asleep or from malposition when awake. Three years ago, during very hot weather, he suddenly became weak in the legs, fell, did not lose consciousness, but dragged his foot for a few hours afterward. Examination of the patient, in May, 1885, revealed nothing of importance wrong, except with the eyes. The study of these, made by Prof. Wm. Thomson, showed diminution of the acuteness of vision, slight atrophy of both papillæ, especially the left; no evidence of present or previous choke-disk, and sharply defined and complete bitemporal hemianopsia. The patient was seen at intervals during two years. During this time the papillæ became more white, the hemianopsia remained the same, the headaches were unaltered, the intellect was normal, though once or twice there had been some passing confusion of mind. His death occurred from a sudden onset of coma, lasting but twenty-four hours. The autopsy revealed an aneurism, pyriform in shape and larger than an egg, projecting upward from the sella Turcica, and separating the optic nerves by fully one inch. A separation seemed to have taken place in the centre of the optic commissure, pushing the optic nerves and tracts to the outside of the tumor. The commissure could not be found. The right and left internal carotids were found intimately connected with and apparently forming the tumor. The aneurism had caused

absorption of the olivary process and the optic grove as far as its anterior border, and was firmly attached to the bone.

It seems needful to suppose, Mitchell says, that an anomalous artery connected the carotids by passing under the chiasm. This branch became aneurismal, and, enlarging, lifted the chiasm until this parted in the middle line, leaving a nerve on each side, thus dividing the right and left fibres, which, crossing in the chiasm, supply the nasal sides—the temporal visual fields of each eye. The absence of optic neuro-retinitis is a notable fact, and that the presence of a pulsating mass, as large as a lemon, caused so little disturbance of mind or of motor or sensory functions is interesting.

In order to throw additional light upon this case, Dr. Dercum has appended to the paper a collection of anomalies of the circle of Willis.

Empyema in Children treated by Resection of Rib and Injection of Iodoform Emulsion.

Blake (*Lancet*, February 16, 1889) reports six cases of empyema, all treated by resection of a portion of a rib, the removal of the flaky organized lymph with a sharp spoon, and the injection of four ounces of iodoform emulsion, three ounces of which were allowed to run out again. In all the cases the wound healed within sixteen days. The author has little doubt that the iodoform emulsion materially hastened the healing process.

A Case of Ulcerative Endocarditis limited to the Tricuspid Valve.

John Trumbull (*N. Y. Med. Record*, January 26, 1889) describes a case in a man who had for eight or more days suffered from chills, fever, headache, weakness, anorexia, and diarrhœa. While under observation he had repeated attacks of sudden dyspnœa and intense cyanosis, the cause of which could not be discovered. Physical examination revealed dulness at both bases, with absence of voice sounds, and faint but clear respiratory murmur, and a small patch of dulness below the left clavicle. The cardiac dulness was normal, and no distinct murmur could be detected. The liver and spleen were considerably enlarged. The possibility of the presence of typhoid fever, pulmonary thrombosis, acute double pleuro-pneumonia, intermittent fever, or acute miliary tuberculosis, was entertained, but there were sufficient reasons to exclude all of these, and the author made the diagnosis of ulcerative degeneration of the right side of the heart, in spite of the absence of murmur. He based this diagnosis on the repeated chills, the cyanosis, due, probably, to repeated minute embolic processes in the lungs, the patch of pulmonary consolidation noted in the left lung in front, fluid in the pleural cavities, the enlarged spleen and liver, and the presence of albumin in the urine. The patient steadily grew worse; the amount of fluid in the chest increased and was aspirated, the temperature chart continued very irregular, there were frequent chills, great dyspnœa, and finally œdema and hemorrhagic extravasations, and death. The autopsy showed pleural effusion, multiple purulent foci, and a few hemorrhagic infarcts in the lungs and kidneys, and great enlargement of the liver and spleen. The condition of the heart was very

interesting. There was no enlargement of the organ, and the left chambers, with their valves, were normal. On opening the right auricle so as to look down on the tricuspid valve, there were seen two crumbling masses of vegetation, three-quarters of an inch long and one-half inch high, flattened from side to side, looking upward toward the auricle, and separating somewhat toward the remaining valve. This valve was unaffected, except for ulcerated points where closure made pressure against the verrucose growths.

The case is interesting, not only from its rarity and the absence of auscultatory symptoms pointing to disease of the heart, but on account of its obscure etiology. There had been no antecedent rheumatism, no valvular disease, no trauma, no previous illness, no urethritis, and the patient was a seafaring man, breathing the purest air.

Progressive Muscular Dystrophies.

Under this title Sachs in a very valuable paper (*N. Y. Medical Journal*, Dec. 15, 1888) includes those forms of disease in which a primary progressive wasting of some or all of the muscles of the body is the most characteristic feature, and in which the wasting (atrophy) may or may not be associated with true pseudo-hypertrophy of some of the muscles. Though these primary muscular dystrophies are the chief subject of his discussion, he first devotes considerable attention to typical spinal muscular atrophy, since a very large number of cases of the peripheral type as well as of different spinal forms were once classed under this term.

The author next considers in order and in detail the different forms of primary muscular atrophy, reviewing thoroughly the literature of the subject, quoting cases from his own experience and that of others, and describing the histological conditions and differences as far as known. He ends his paper with the following conclusions:

1. Progressive muscular atrophy, type Aran-Duchenne, is due to spinal cord disease. The peroneal type of progressive muscular atrophy bears close resemblance to this form and may possibly have a similar pathology.

2. Duchenne's type of progressive muscular atrophy might be termed the hand type, while the peroneal form would represent the leg type.

3. Pseudo-hypertrophy is not of spinal origin. Lipomatosis is a mere incident in the course of the disease and is associated with widespread atrophy in various parts of the body.

4. There is a close relationship between pseudo-hypertrophy and Erb's juvenile form of progressive muscular atrophy, but not an absolute identity. This close relationship is marked by the onset of the diseases at an early age, by the entire absence of fibrillar contractions in both forms, by the absence of reaction of degeneration, and by the occurrence of lipomatosis some time during the course of the disease. They differ from each other in the distribution of the muscular atrophy, and possibly in the histological changes in the affected muscles.

5. Hereditary muscular atrophy does not deserve the rank of a separate clinical entity, all forms of primary myopathies being occasionally hereditary.

6. The type of Landouzy and Déjérine is closely related to Erb's form, the

additional involvement of the face muscles not being sufficient basis for a wide clinical differentiation.

7. Pseudo-hypertrophy and Erb's form should be regarded as the two representative forms of primary progressive dystrophies.

8. Primary progressive dystrophies are distinguished from spinal progressive dystrophies by their cardinal symptoms, the onset at an early age, the occurrence of true or false hypertrophy, the absence of the reaction of degeneration, and the absence of fibrillar contractions.

As the term "progressive muscular atrophy" has been widely used as a general title, the author substitutes for it Erb's designation "spinal progressive amyotrophia."

Believing that the anatomical distribution of atrophies or hypertrophies does not form a sufficient basis for classification, he would reduce the classification to the following simple form:

1. Amyotrophia spinalis progressiva:
   - *a.* Hand type;
   - *b.* Leg type—peroneal form.
2. Primary progressive dystrophies:
   - *a.* Pseudo-hypertrophy;
   - *b.* Erb's form.

The description of the exact anatomical distribution of the cases under Class 2 may be left to the individual author.

SURGERY.

UNDER THE CHARGE OF

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The Present Aspect of the Iodoform Question.

Dr. W. W. v. Arsdale (*Annals of Surgery*, March, 1889) states his belief that the evidence now before us points to the conclusion that iodoform by attacking the products of bacteria can be of great practical value as a surgical dressing, as we need only to adopt the view that microörganisms introduced into the tissues could be successfully combated by the vital action of the latter, perchance by the leucocytes and the phagocytes, unless the bacteria were assisted in their work by the ptomaines, upon which the iodoform may, and probably does, exert a destructive action. This, however, is as yet merely theory, but some proper conclusions may undoubtedly be deduced from the mass of experimental evidence which is now available.

Since we know that iodoform may contain germs, we should sterilize it before use; this may be done by washing it in sublimate solution. If applied

with a brush to a wound the brush should not be used again. A powder-blower for iodoform should be used in a pure atmosphere only. We will not look for the action of iodoform at a distance, an action throughout a wound when only a portion of it is in contact with the powder, nor at the depth of a wound when only the surface is covered with iodoformized gauze. We will not use iodoform during a primary operation in uninfected tissues, since we know that septic infection will not be counteracted by the simultaneous application of iodoform. But we will esteem iodoform for its action in preventing the subsequent infection of wounds, both during the change of dressings and in case of accidental exposure. We shall continue to use it sparingly in granulating wounds, as we cannot dispense with its property of favorably influencing the granulations, always taking care in suppurating wounds to prevent retention by adding protective over the iodoform. In wounds already septic we may use iodoform as extensively as possible, endeavoring to bring the powder into contact with every part infected. We shall not expect it to influence already existing septicæmia or pyæmia.

The greatest benefit will be derived from iodoform by its use in operations about the mouth, vagina, and rectum, where, owing to its property of destroying the ptomaines, it acts as a powerful deodorizer. For the same reason its use on putrid surfaces is to be recommended.

On the other hand, the poisonous qualities of the drug, its disagreeable odor, its irritating effect, when suspended in the air, on the mucous membranes of the eyes and nose, prevent its extended use; and since we have found in tartaric and other vegetable acids a means of rendering our sublimate solutions more active upon albuminous liquids, and in creolin (in strong solutions, 5 per cent.) a means of keeping granulations in good condition, we are able to dispense with iodoform in all but its influence against the ptomaines, which is of so much practical value to us in our treatment of wounds of mucous membranes, and which cannot be sufficiently replaced by chlorine solutions or charcoal powder.

Purpura and Malignant Growths.

Dr. Thomas Harris (*The Medical Chronicle*, February, 1889) quotes the six well-known cases of Dr. Hilton Fagge of multiple sarcomata associated with hemorrhages into the skin and other parts, and then gives in detail the results of the autopsies on three cases of mediastinal lymphosarcoma associated with petechial hemorrhages into the skin, stomach, intestine, peritoneum, and pericardium. His observations in these cases and his review of the pathology of purpura lead him to the belief that embolism of small vessels is the most common cause of the purpura and other forms of hemorrhage which come on in cases of malignant growths.

Symmetrical Gangrene.

Mr. Joseph Collier reports (*Medical Chronicle*, February, 1889) an interesting case of Raynaud's disease occurring in a woman twenty years of age, and accompanied with severe abdominal pain, pain in the extremities, pain and numbness in all the fingers and toes, gangrene of the three inner toes of the left foot, and paroxysms during which the hands and feet became white,

semi-transparent, cold, and anæsthetic. At the end of two months she died. At the autopsy there were found eight ounces of pus lying in the neighborhood of the cœliac axis. There was peritonitis especially well marked in the region of the solar plexus, and it was thought probable that the irritation of the great abdominal sympathetic system was the cause of the arterial spasm which determined the paroxysmal symptoms in the extremities and the gangrene of the left toes.

Considered from the point of causation, these cases of this well-marked disease seem to fall into one of several groups:

(1) Those due to direct stimulation of the peripheric ganglia. In this group are the cases with gangrene dependent on vascular spasm, produced by some altered condition of the blood. Of course, in these cases the production of gangrene will be partly due to malnutrition of tissue, and partly to the action of the blood on higher cerebro-spinal centres, as in cases of paroxysmal hæmoglobinuria.

The gangrene of Bright's disease and of diabetes mellitus will be, to some extent, produced in this manner. The vaso-motor symptoms in alcoholic paralysis are probably also due to the circulation of impure blood.

(2) Those due to irritation of prevertebral sympathetic ganglia, or vaso-motor nerves leaving them, as in the case recorded above. Probably pathological conditions of the large abdominal sympathetic ganglia are much commoner than is usually suspected, especially in anæmic girls of the age generally attacked by Raynaud's disease.

(3) Those due to irritation of central origin, as in a case of gangrene of the left hand recorded by Hochenegg, where chronic hydrocephalus and syringomyelia were found at the post-mortem. Cases more or less due to emotional origin would come into this group.

(4) Those due to some peripheral stimulation acting reflexly through cerebro-spinal centres. Thus cutaneous sensory nerves irritated by cold, or, in cases of symmetrical gangrene, from scleroderma. Here, again, part of the action of peripheral neuritis in producing arterial spasm will be produced in this manner.

In the cases of the disease associated with syphilis, congenital or acquired, it is difficult to be positive that endarteritis, or some other arterial degeneration, has not been the main cause.

Curability and Treatment of Syphilis.

In concluding his admirable lectures upon syphilis and the nervous system Dr. W. R. Gowers states (*British Medical Journal*, February 16, 1889) his beliefs as to some important matters as to which there is still much difference of opinion in the profession. He says there is no real evidence that syphilis ever is or ever has been cured, the word syphilis being used here to designate that which causes the various manifestations of the malady. The assertion that "syphilis is an incurable disease" is the shortest way to state this fact, and is legitimate if we recognize that by "incurable" we merely mean that there is no proof of cure. The conclusion that the essential element in the disease resists treatment, and runs its course uninfluenced by our efforts, is in harmony with what we know of other specific diseases due to a poison intro-

duced from without, and communicable from one person to another. There is not any fact whatever to show that a single disease of this kind can be cut short. The course of the acute exanthemata cannot be arrested by any means at our disposal at any stage of their course, and the same seems true of this chronic exanthematous disease. This is eminently true, also, of the disease that stands perhaps nearer to syphilis than any other known malady—leprosy.

He believes that the iodides are effective in themselves, and do not act merely by bringing into activity the mercury which may have been deposited and held inert in the various tissues; that there are probably late syphilitic lesions over which the iodide has no influence and which yield to mercury, although he had seen no case of intracranial disease in which there was reason to believe that mercury was successful when the iodide had failed. He prefers the employment of mercury by inunction, and says wisely that he has been deterred from trying the hypodermatic method because published evidence did not afford satisfactory proof of superiority, "and because this method seems to afford an opportunity for psychical influence not free from risk of that which is undesirable." He prefers interrupted courses of treatment, which should be energetic but should continue only a little longer than is necessary to remove the lesion; being repeated, it may be, after an interval occupied by tonic treatment, or by the other of the two chief drugs. He adds: "If it is true that we cannot cure syphilis, it is most important to consider how it can be best kept in check. This is why the fact of incurability, if true, is so important. A mistaken belief in curability may dangerously hinder attempts at prevention. If no present treatment can prevent future developments, then it is wise, whether these come or not, to anticipate them. I think a custom, sometimes recommended, is prudent, that every syphilitic subject, for at least five years after the date of his last symptoms, should have a three weeks' course of treatment twice every year, taking, for that time, twenty or thirty grains of iodide a day. If this practice were adopted generally, is it not reasonable to anticipate grave lesions would be much more rare?"

Dr. Gowers' opinions are always worthy of careful and respectful consideration, but those expressed here in reference to the essential incurability of syphilis, and in regard to the employment of interrupted courses of treatment are so important and, at the same time, so much at variance with those of many distinguished syphilographers, that it seems right to suggest that possibly they are the result of an experience which deals chiefly with the later, the graver, and the most intractable forms of the disease, namely, those affecting the great nerve centres, and which does not give the neurologist the opportunity of following the course of the case from the primary stage through many subsequent years, as constantly happens in the work of both the syphilographer and the general practitioner. They should not be considered as decisive, nor does Dr. Gowers himself seem so to regard them, as they are most modestly advanced.

Early Staphylorrhaphy.

An interesting case of cleft palate and harelip was reported by Dr. Julius Wolff, at the last meeting of the German Surgical Congress (*Archiv für klinische Chirurgie*, Band xxxviii., 1888). The case was a most severe one;

the opening in the upper lip was very wide, the edges being fully a half inch apart from each other; the alveolar process, as well as the velum and uvula, was completely divided. Two days after the birth of the child Wolff operated upon the harelip, and a little later transplanted the left wing of the nose, which had been drawn to one side by the harelip, to its natural position. This gave both nostrils a normal appearance. When the child was five months old the uranoplastic operation and staphylorrhaphy were performed. The wounds healed well and by first intention. Complete recovery soon followed.

Wolff argues that the mortality attending operations of cleft palate in young children would be considerably lessened if the operation were performed when the child was a few months old; if greater care were taken to avoid even the slightest hemorrhage; and if the operation were done in successive stages, performing one portion of it on one day and waiting from five to eight days before performing the next. The child in question had had no less than six operations. During the entire treatment there was no fever, nor any loss of appetite.

In conclusion, Wolff says that in operating by this gradual method the probabilities of healing by first intention are greatly increased.

Bloodless Extirpation of Tumors of the Thyroid.

Prof. Bose (*Centralblatt für Chirurgie*, January 5, 1889) recommends in these cases an incision beginning over the lower portion of the lateral lobe and running outward and upward toward the angle of the lower jaw. The tissues are divided down to the capsule. The circumjacent connective tissue is separated with the finger. The tumor is pulled upward out of the wound as far as possible, a position which greatly lessens the amount of blood which it contains. An elastic cord is then passed around it and tightened, after which the diseased nodules are dissected or scraped out, the ligature being strongly pulled upon during this proceeding, and finally embracing the pedicle, which often consists of healthy tissue. In Bose's cases no hemorrhage followed the removal of the ligature and the wound cavity did not require to be packed. In those cases in which the tumor has penetrated to the post-sternal or post-tracheal region and has contracted firm adhesions, this method is inapplicable.

Successful Extraction of a Tooth-brush from the Stomach.

Dr. Hashimoto, Surgeon-General of the Imperial Japanese Army, reports (*Archiv für klinische Chirurgie*, Band xxxviii., 1888) a case of a woman forty-nine years of age, who, for the purpose of emptying her stomach, was in the habit of irritating the fauces and pharynx with a Japanese tooth-brush, a wooden instrument six or seven inches in length, one-fourth of an inch in breadth, and with bristles at one end. In May, 1872, during this manipulation, she swallowed the tooth-brush. This was followed by severe pain in the epigastrium and some fever, but these symptoms after a time lessened. Eleven months later pain returned, a fluctuating swelling appeared in the epigastric region which opened spontaneously, the pointed end of the tooth-brush protruding through the opening. The attending physician endeavored

unsuccessfully to extract it, and, finally, contented himself with cutting off the projecting portion, leaving the remainder. The wound healed, leaving only a disagreeable sensation as of the presence of a foreign body.

At the end of August, 1886, the pain and swelling reappeared, this time in the neighborhood of the umbilicus, followed, in a couple of months, by the formation of another abscess, which also discharged. In November, 1888, several fistulous openings existed in the neighborhood of the umbilicus, through one of which the probe could be readily brought in contact with the foreign body. The fistula was enlarged, the foreign body seized with forceps, and after considerable difficulty extracted. Its removal was accompanied by an audible escape of odorless gas; the wound was stitched together and dressed antiseptically. The discharges which appeared were found to have become strongly acid. This fact, together with the escape of gas, indicated the existence of a gastric fistula. This, however, gradually diminished until at the end of the fifth week the wound was entirely healed, the patient having had no alarming symptoms. Dr. Hashimoto compares with this the history of another patient who had swallowed a tooth-brush precisely similar in size and shape in 1879, and who was operated upon a week later. In this case the opening in the stomach was exposed, and as the edges were found to be necrotic, the wound was excised and stitched together by Lembert's sutures. The patient died three days later. Dr. Hashimoto contrasts the early and late operations, and quotes some statistics to show the great mortality of the former.

Abdominal Section for Acute Intussusception in a Child Three Years of Age.

Prof. Thomas Annandale reports (*The Edinburgh Medical Journal*, March, 1889) a case of a child admitted to the hospital with marked symptoms of intussusception, vomiting, bloody passages, etc., and with an elongated tumor in the left lumbar region which could also be felt through the rectum. Small doses of opium, enemata, and the use of rectal bougies having failed to reduce the invagination the abdomen was opened and gentle traction was made on the intestine above the tumor, which suddenly disappeared. The patient recovered without a complication. Mr. Annandale emphasizes the importance of early operation in such cases when other means have failed to relieve the condition.

It is true that in a small number of cases of intussusception (about six per cent. in patients between the ages of two and five years, according to Leichtenstern) spontaneous elimination by gangrene of the gut takes place, but a certain proportion of such cases do not ultimately recover, but die from causes in connection with the intestinal condition; and, therefore, it must be considered that, unless an acute intussusception is relieved in the early stages of the case, it is, especially in young children, a very fatal disease.

The treatment of this affection by enemata or insufflation can only be successful in its early stages, although a few exceptional cases have been recorded; and it should always be remembered that in the later stages this treatment is attended with considerable risks.

A further observation of importance in connection with operative interfer-

ence in cases of intussusception is, that reduction of the invagination is, in the majority of instances, more easily accomplished when the operation is performed during the early stages of the condition; and Mr. Treves has shown in his tables of statistics that the easier the reduction the less the mortality; when the reduction is easy the mortality being 30 per cent.; and when difficult or impossible, 91.3 per cent. An additional advantage of an early operation is that, in the majority of cases, a limited abdominal incision, with a limited amount of interference with the abdominal contents, will be sufficient to relieve the condition.

Treatment of Gangrenous Hernia.

Dr. Ferdinand Klaussner (*Münchener medicinische Wochenschrift*, February 6, 1889) reports fourteen cases of resection of the bowel in gangrenous hernia; seven of which resulted in recovery. In six of these normal action of the bowels was restored, and in one a fistula was formed. In the fatal cases death resulted, with one exception, from collapse. We quote one case, which will show Klaussner's *modus operandi*.

The patient was a well-built woman, suffering from a strangulated umbilical hernia about the size of a hen's egg, and of three days' standing. Taxis was tried without avail. The surrounding skin was of a greenish hue. A superficial incision was made five inches long, and the underlying tissues were cut through on a grooved director. A discolored and fetid portion of the mesentery and a loop of the bowel, also discolored, were then laid bare. The strangulating tissues, which were very tense, were cut through and the bowel drawn forward. The opening of the abdominal cavity was then closed by means of a compress of bichloride gauze. The gangrenous portions of the bowel and mesentery were then resected, one and two-thirds inches of healthy tissue being included on either side. The entire portion resected measured fourteen inches. The edges of the mesentery were now brought together with a row of interrupted sutures, then the peritoneal surfaces with additional sutures. The bowel itself was united first by a row of sutures in the mucous membrane, and a second row in the serosa. For this the finest silk was used. The bowel was then washed with a solution of bichloride, 1 : 3000, and dusted with iodoform, then replaced in the abdominal cavity; the peritoneum was closed with catgut sutures, and finally, the skin was brought together with strong silk sutures after the gangrenous portions had been cut away. The lower extremity of the wound was left open for drainage. An antiseptic dressing was then applied. The wound healed well, there was no fever, and in three weeks the patient was discharged as cured.

Supra-pubic Lithotomy.

Dr. Robert F. Weir reports (*The Medical Record*, March 9, 1889) a case of phosphatic calculus removed by supra-pubic section from a man seventy-nine years of age. The special points of interest were these: 1. The successful result of a cutting operation at an advanced age. 2. The ease with which, by a clawing or rake-like action of the fingers the subperitoneal fat may be drawn upward from behind the pubis, after a splitting of the recti muscles in the median line, thus quickly and safely exposing the bladder without hemor-

rhage. 3. The use of a drainage tube with lateral decubitus for three days, the opening in the bladder closing in twelve days. 4. The occurrence of iodoform mania as a result of packing the wound with a ten per cent. gauze.

Abdominal Actinomycosis.

Dr. Mikulicz reports (*Berliner klinische Wochenschrift*, Feb. 11, 1889) 5 cases of abdominal actinomycosis occurring in his clinic at the Königsberg Hospital.

The last one was that of a young man, aged nineteen years, who, about a year since, had discovered a swelling to the right of his navel, which rapidly grew larger, and finally burst open. He was treated for seven months at a provincial hospital in Russia without avail, and was subsequently brought to Königsberg. Dr. Mikulicz found the patient in a poorly nourished condition and very weak. The tumor was as large as a child's head, of a reddish color, and covered with small granulating patches, varying in size from that of a pea to a bean. On pressure these patches secreted a fetid pus containing numerous granules. These granules were found to be actinomycotic. The entire growth was removed. The external oblique muscle was found to be infiltrated with a yellowish substance, which was scraped out, and was found to be of the same character. The wound was dressed antiseptically, and in eight weeks the patient left the hospital cured.

Nephrorrhaphy.

Frank (*Berlin. klin. Woch.*, No. 9, 1889) vigorously defends nephrorrhaphy as a justifiable and, in its issue, satisfactory operative procedure in case of wandering kidney. As contrasted with nephrectomy, out of fifty-six operations, but two died; while of seventy cases of extirpation, twenty-seven terminated fatally.

The operation, with few exceptions, has been performed by the lumbar incision. The thread should under all circumstances embrace not only the true capsule of the kidney, but also the parenchyma of the organ. The organ should be fixed to the wound by its whole posterior surface, and in its normal axis. Of the two fatal cases, one occurred at the hands of Cecherelli, who passed his fixation threads about the twelfth rib. On section, a fatty heart, diseased arteries, and pleuritic effusion were found. The other fatal case occurred in the practice of Hahn. The symptoms strongly suggested ileus, but as there was a movable kidney, it was sutured in place. Death occurred two days later without amelioration of symptoms.

Of 39 cases, there was complete disappearance of all symptoms in 21, great improvement in 9, moderate improvement in 2, and no improvement in 7. It is to be remarked that in some cases where absolute fixation was secured, the symptoms were not materially bettered, while in other cases, where there was partial fixation only, there was possibly complete relief. In 4 cases, where fatty capsule was sutured to the wound, the kidney became again freely movable in every case with return of all the symptoms. In 11 cases, where the threads were passed through the parenchyma of the kidney, the organ was firmly fixed in 10, very slightly movable in 1. Of these 11

cases, 9 were permanently cured; 2 were greatly relieved. In 4 cases, where nephrorrhaphy was not successful, a subsequent nephrotomy was performed, the patients all recovering.

After operation the dorsal decubitus should be preserved for several weeks, till the kidney is firmly anchored by a well-formed cicatrix. As for the operative indications, when a movable kidney is excessively painful and causes serious impairment to health, all other therapeutic measures failing, nephrorrhaphy should be performed. If this in turn proves unsuccessful, the surgeon should, as a last means, resort to nephrectomy.

The Wire Suture in Old Fractures of the Patella.

Mr. G. R. Turner reports (*Lancet*, February 23, 1889) a successful case of wiring of an old patellar fracture, in which recovery was finally perfect in spite of an extensive separation of the soft parts which occurred when movement was begun.

We have from time to time published cases in which primary suture of the patella after simple fracture has proved successful, and recorded the opinion of many eminent authorities in favor of it; but, whilst the percentage of deaths on the showing of one of the strongest advocates for its employment amounts to 1.4, and the treatment by apparatus involves no risk—even bony union is occasionally obtained—operative measures will be resorted to with reluctance by the majority. There are certainly some which would do better under operative treatment, but no definite rule for the guidance of the surgeon can be drawn from a comparison of the published cases. When, as in this case, the limb is comparatively useless, should the operation be performed? To this the answer will usually be in the affirmative. But what are the results of treatment as compared even with those of recent suture. Söderberg collected statistics of 81 cases; 41 of these were operated upon by primary suture; in 37 there was a good result, in one ankylosis followed suppuration, in 3 only partial mobility was obtained, and in 1 fibrous union; 38 were cases of long-standing fracture, in which the result obtained by other methods was considered unsatisfactory; in 14 there was a good result, in 8 ankylosis resulted, whilst in 3 the operation was followed by death. The mortality, therefore, is high. This is confirmed by the statistics of Valaguier on the operation in old cases. Out of 45 operations, 22 were successful; in 9 there was partial ankylosis; in 11 complete ankylosis (in 10 of these the joint suppurated); 3 died.

Success or failure will much depend upon the selection of cases, both as regards condition of limb and the presence of any constitutional disease or deterioration of general health—as from addiction to alcohol.

It is not that sufficient care is not taken in the use of antiseptics, some of the most careful in this respect having had untoward results. In some it has been found almost impossible to bring together the fragments owing to contraction of the quadriceps muscle, which it has been necessary to divide in order to obtain success. Von Bergmann, in one instance, did not divide this muscle, but chiselled off the tubercle of the tibia, and then united the fragments, with good result. A vertical incision over the centre of the joint is usually employed in this country, though the fragments have been sutured through a transverse incision. In some cases no drainage has been used, the

object being to obtain primary union throughout. Mr. Turner recorded a case in which the wires required removal some months after the operation, having been the cause of recent suppuration in the joint. They are, however, commonly left and rarely produce inconvenience. Ceci crosses the wires obliquely, passing them through lateral incisions.

Compression or Ligation of the Common Carotid Artery in the Immediate Treatment of Apoplexy.

Mr. Walter G. Spencer and Mr. Victor Horsley (*British Medical Journal*, March 2, 1889) suggest that in those cases of hemorrhage from the middle cerebral artery in which the hemorrhage continues for a longer or a shorter time, or, in other words, in those in which it is not so large that death immediately ensues, nor so small that it ceases immediately, the common carotid shall be at once compressed against the vertebræ, or that when there are time and opportunity it might be exposed, and a stout ligature passed around it by which the vessel should be exactly compressed by drawing it up against the fingers, without, at the same time, exerting any unfavorable pressure on the veins and nerves. This should be done with two precautions: The wound must be kept aseptic and the internal coat of the vessel should not be injured. At present the mode of "treatment" is by position—that is, raising the patient into a half-sitting posture—but, while this lessens the flow of blood to the bleeding vessel, it is also lessened in the same proportion to the rest of the brain, which, at this time, needs its full circulation, both in the areas around the injury, so that the arterial flow should meet with greater resistance as the compression begins to involve those areas, and also because the full supply is needed in the respiratory centre to keep it at work. Venesection has been employed, but while it diminishes the circulation in the brain as a whole, it has no effect upon the rapidity of coagulation, for, if an animal be bled to death, it is only the last blood which flows that coagulates more quickly. From this point of view, therefore, it offers no advantage to the patient. The authors believe that the greater frequency of hemorrhage from the lenticulostriate and other basal branches of the middle cerebral is due to the fact that they are exposed to the direct force of the stream from the external carotid, which is not the case with the other cerebral arteries. Experiments upon monkeys lead them to believe that in such cases ligating the common carotid, while not adding materially to the risk of life, might permanently diminish the intra-vascular tension and save the diseased vessel-wall from renewed strain in the future. Their paper rests on a threefold basis, anatomical, pathological, and experimental, and they express the desire that the treatment which they propose may have the benefit of critical examination at the hands of the profession.

Arthrodesis.

Dr. Hermann Euringer (*Münchener medicinische Wochenschrift*, February 5, 1889) gives the result of his investigations into the history of arthrodesis, and cites a number of cases. The operation was performed by Dr. Louis Bauer, of New York, as long ago as 1860. The case was one of traumatic separation of the epiphyses of the lower end of the femur which had caused

a deformity resembling genu-valgum. The external condyle was entirely gone and the internal one was greatly enlarged. The lower part of the leg could be rotated so that the calf would be entirely turned around to the front. Bauer excised the joint and fastened the bones together with iron wire. Complete ankylosis of the joint resulted, and in one month the patient was able to walk well.

Euringer cites fifty cases and sixty-nine operations. Arthrodesis was most frequently performed in cases of poliomyelitis, also in club- and flat-foot, when these were accompanied by paralysis. For this Zinsmeister suggests arthrodesis of the talo-navicular or of the talo-crural joint. Wolff was the first to apply this operation to myopathic and habitual luxations. His first case resulted in the cure of an habitual luxation of the humerus by causing a union of the ligaments, and thus fixing the head of the bone firmly in its place. The same operation was performed also by Albert and others with success.

In one of Euringer's cases arthrodesis was performed upon both hip-joints, causing complete ankylosis, and in six months the patient was able to walk well with only the assistance of a cane.

Gangrene of the Lower Extremities following a Blow upon the Epigastrium.

Mr. George Curtis reports (*British Medical Journal*, February 16, 1889) the case of a man, aged twenty-eight years, who, on July 10th, received a severe blow with a capstan bar on the abdomen. On August 4th he was admitted to the hospital at the Cape of Good Hope suffering from gangrene of the lower extremities, the line of demarcation being well marked in each by an irregular ring from four to six inches above the malleoli, a condition necessitating double amputation from which the patient made a good recovery.

The *rationale* of the process of the gangrene set up simultaneously in both feet after a blow on the abdomen is not self-evident. The man had a rather weak pulse, but the heart-sounds were normal; he was a native of the tropics, entering suddenly into a temperate and comparatively cold climate, and was liable to chilled feet by his occasional occupation—namely, washing clothes on a lead flooring; and these circumstances may have predisposed to blood stagnation of the extremities. But the efficient cause of the gangrene was plainly the severe blow on the epigastrium, and the subsequent chain of events seems to have been shock of the sympathetic system, through the sudden contusion of the solar plexus and splanchnic ganglia, etc. (analogous to the concussion of the brain or spinal cord); relapsing syncope of the heart, with general vasomotor paralysis and stasis of blood in the remote vessels. The blockage of the tibial vessels seems to have been too great for the returning circulation, and local death ensued.

The Transplantation of Large Strips of Skin.

Dr. George R. Fowler reports (*Annals of Surgery*, March, 1889) a case in which human and frog skin were simultaneously used for the purpose of

covering in the ulcer following a burn. The estimated area of the burnt surface was about two hundred and forty-eight square inches. Five weeks later but little progress had been made toward cicatrization. The surfaces were cleansed and disinfected. The skin from the back and abdomen of a live frog was transferred to the granulations occupying the region of the left buttock. On the right buttock eight strips of human skin were placed after the manner of Thiersch. They were laid in place by strapping with oiled silk and gauze compresses wet with a sterilized salt solution of 6 to 1000. There was a rapid improvement followed by cicatrization, which was almost complete in less than three weeks, but subsequently there was breaking down at several points, evidently the result of pressure. The patient was finally discharged cured six months later without the least tendency to contraction of the surface of repair. It was noticeable that a decided fall of temperature followed immediately upon covering in each suppurating and granulating surface. In other words, septic absorption ceased as soon as the actual vital resistance of the tissues was reinforced and the granulations were perfectly protected from atmospheric influences. Dr. Fowler gives detailed instructions for preparing the ulcerated surfaces for the operation, and for the removal of the skin to be employed, as well as for the subsequent dressings.

OTOLOGY.

UNDER THE CHARGE OF

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AURAL SURGEON, PRESBYTERIAN HOSPITAL, ETC., PHILADELPHIA.

The Causes of Furuncles, with Special Reference to those found in the Ear.

Dr. C. Schimmelbusch has made some researches in reference to the above-named subject (*Archiv für Ohrenheilkunde*, Bd. 27, February, 1889). Furuncles may be divided into idiopathic and symptomatic, according to some authorities, but the author of the article we are considering endeavors to demonstrate by his experiments that furuncles are due to local infection by means of staphylococci. A review of his microscopic and experimental labors seems to show clearly that furuncles are caused by rubbing staphylococci into the hair follicles of the skin. Two elements must be admitted in the causation of furuncle: *first*, the presence of pyogenic staphylococci in large quantities upon the surface of the skin; and, *second*, some form of rubbing them in.

In regard to the first point, the presence of staphylococci, it is claimed that the dirtiest people are most frequently affected with furunculi, as they are not careful to wash away the infectious spores from the skin when they first land there, and after one boil forms, the discharge from it is not quickly and carefully removed, and hence new boils are formed as successors to the first.

Respecting the second point, rubbing in the spores is shown to be a cause

of furunculi, and it explains the so-called predilection of boils for certain places on the body. The neck, the waist, the buttocks, become readily the seat of boils, because pressure and friction are exerted upon these points by tight-fitting and closely pressed clothing, aided by the motions of the body.

Pustules and furuncles occur at other parts of the body, like the lip, the chin, the eyelids, and ears, because these points are subjected to repeated irritation and rubbing from the patient's hands.

That a tendency to furuncles is manifest in certain cachexiæ, cannot be denied. The same diatheses favor the formation of phlegmons and abscesses, and the conclusion is justifiable that such bodies offer a better soil for the growth of staphylococci. In many cases, however, in which the multiplication of furuncles suggests the thought that some constitutional complaint is the foundation for their occurrence, a closer investigation shows that the inner man is sound, and the treatment of the disease by cleanliness and rest has demonstrated that there were only two factors in the causation of the disease, viz., the presence of the staphylococci on the skin, and their being rubbed into the hair follicles.

Pyæmia from Acute Otitis Media.

Reinhard and Ludewig report two cases of pyæmia resulting from acute otitis media (*Archiv für Ohrenheilkunde*, Bd. 27, February, 1889; Report of Ear Clinic in Halle).

The first case, one of otitis media acuta, on the left side, in a man, twenty-four years old, resulted in a secondary inflammation of the mastoid cells, pyæmia, and a metastatic gluteal abscess of enormous size. Recovery ensued in four months. The inflammation of the ear was due to a severe cold and sore throat. In a month from the initial symptoms of cold, the symptoms of the gluteal abscess set in, the ear having been the seat of acute inflammation in the meantime. In four months the patient was discharged from the hospital entirely cured, excepting a persistent perforation in the membrana tympani. In the second case, a man, twenty-five years old, a severe pyæmia followed an acute otitis media. The patient had nearly recovered from the inflammation in his ear when an imprudence in eating induced fever and headache. The mastoid became inflamed, and was trephined. There then ensued a period of three months of fever and light chills at intervals. Great emaciation ensued, and there occurred metastases in both eyes (septic retinitis and multiple retinal hemorrhages) with an abscess in the left shoulder-joint and in the muscles of the upper arm. Finally, recovery of hearing and health occurred in the course of five months from the time of the first angina and otitis media.

Treatment of Otorrhœa by means of Powdered Boric Acid.

This article, by Dr. Meyer, of Copenhagen (*Annales des Mal. de l'Oreille*, February, 1889), is one setting forth some of the objections to the employment of powdered boric acid in the treatment of otorrhœa. It is, in fact, a review of the *pros* and *cons* of the subject since boric acid was first introduced to otological work by Bezold, of Munich, in 1880. Most of the objections can be traced to the improper use of this valuable antiseptic, though it is doubtful

whether some of the evils attributed to its misuse can be really substantiated, as, for instance, the increase in the frequency of mastoid disease since the introduction of boric acid in the treatment of ear disease.

It can be unhesitatingly and most positively asserted that powdered boric acid should not be used in acute otitis media, nor in chronic suppurations of the tympanic cavity with perforation in the flaccid membrana (membrane of Shrapnell). The same may be said of any other powdered medicament employed in the same aural diseases.

It may, however, be employed with the very best results in cases which have passed the acute stage, with large perforation in the membrana tympani in its inferior part, and in which the discharge is slight, and the muous membrane smooth. It should always be used in very small quantities.

Dr. Mayer concludes his article by stating that "the surgeon may, with entire safety, treat every chronic otorrhœa with powdered boric acid when there is a free escape for the pus, if he is careful to use only small quantities at a time, and examine his patient daily. Before insufflation of this powder, the ear should be washed out with care, and dried by means of sterilized cotton. This treatment should never be confided to the patient, nor to his attendants; the physician must do it, with the above-named cautions.

Lupus of the Middle and Internal Ear.

Lupus not uncommonly spreads from the skin of the face to the auricle, but it is very uncommon to find that lupus has passed from the nasopharyngeal mucous membrane, *viâ* the Eustachian tube, to the cavity of the middle ear and thence to the internal ear. A case of this nature, however, is reported by Dr. Gradenigo, of Padua (*Gazetta degli Ospitali*, 1888, and *Annales des Maladies de l'Oreille*, February, 1889). The patient was a man, who died of pulmonary tuberculosis, complicated by a profound laryngo-pharyngeal stenosis, and numerous centres of lupus on his face, body, and limbs. The neoplasm had involved the right auricle, the skin and mucous membrane of the nose, the skin of the lips, etc., and the mucous membrane of the vault of the palate, of the velum, the tongue, the larynx, the pharynx, the left Eustachian tube, and the middle and internal ear on the left side. In addition, the mucous membrane of the frontal and sphenoidal sinuses was infiltrated and swollen.

Post-mortem examination revealed entire destruction of the left membrana tympani, and invasion of the mastoid cavity by a neoplasm mostly of round cells. This same tissue extended into both the fenestræ and the internal ear. There was no trace of the malleus; there were portions of the body and long process of the anvil left. The stapes was imbedded in the aforesaid round-cell tissue. Its head was gone, and the connection between it and the incus was destroyed.

The neoplasm had invaded the internal ear in three ways: 1. By the round window. 2. By the oval window. 3. After erosion of the thin osseous wall separating the Fallopian canal from the summit of the external semicircular canal, the neoplasm had invaded a portion of the perilymphatic space of the latter.

Traumatic Rupture of the Membrana Tympani.

In the report of Prof. Schwartze's clinic at Halle (*Archiv für Ohrenheilkunde*, Bd. 27, February, 1889, p. 297), Drs. Reinhard and Ludewig state that traumatic ruptures of the membrana tympani have invariably healed favorably, if promptly brought to them for treatment, and if improper treatment had not been applied. The treatment carried out in the clinic at Halle consisted in the application of an antiseptic tampon (dry) in the meatus of the auditory canal.

The great mistake usually made is in syringing the ear, or dropping some fluid substance into it, as soon as the organ is injured. This too often conveys septic matter into the drum-cavity, whereby the mucous membrane is soon inflamed and otorrhœa established. The wise course to pursue, therefore, is to effect an antiseptic closure of the meatus, best done by iodoform or sublimate gauze, or cotton-wool, in the form of a soft, dry tampon.

Massage of the Middle Ear.

Reinhard and Ludewig also report that massage of the middle ear, when the seat of exudation, has been carried out in the Halle clinic with good results. The treatment consists in rubbing downward from the mastoid region to the shoulder, in the course of the chief lymphatics of the neck, for from five to ten minutes daily, morning and evening, with the hand well anointed with an emollient.—*Loc. cit.*, p. 298.

Creolin in Diseases of the Ear.

In the same report we find that creolin (ten drops to one-half litre of water) has been used with unfavorable results in the Halle clinic, in furunculosis of the auditory canal, otitis externa diffusa, chronic purulent otorrhœa, both as instillation and a wash, by the external ear, and as an injection by the Eustachian catheter, in acute purulent otitis media after paracentesis or spontaneous perforation of the membrana, and in chronic catarrh with exudation, in order to facilitate the removal of the latter, after paracentesis.

In all of these affections no decrease of the discharge nor lessening of the pain was observed. On the contrary, nearly all the patients complained of an intense burning in the middle ear, Eustachian tube, and the nose even when the solution was made in the strength of five drops to one-half litre of water. Furthermore, the patients complained of the disagreeable odor and bitter taste of the drug.—*Loc. cit.*, p. 300.

Sozoiodol in Ear Disease.

Sozoiodol, too, has received a trial in the same clinic, both in powder and in solution. The number of cases in which this drug has been employed is yet too small to permit definite conclusions as to its effects. Sozoiodol-potassium was used in powder, as insufflation in the ear, and also as an application to the dura mater exposed during the operative opening of the mastoid cavity. An eight per cent. solution was used as an instillation in an offensive suppu-

ration in the ear, but it was not apparent that either the smell or the secretion was essentially affected by the application of the drug.—*Loc. cit.*, p. 301.

Excision of the Malleus.

Drs. Reinhard and Ludewig (*Archiv für Ohrenheilkunde*, Bd. 27, Feb. 1889, Report of Clinic in Halle) report six cases of excision of the malleus in the clinic within the fifteen months—January 1, 1887, to March 31, 1888. More cases, however, have been recorded in their private practice in the same period. In four cases there was a perforation in the membrana flaccida, close above the short process of the hammer. In all of these cases necrosis of the malleus head was diagnosed, and verified by the operation.

The very chronic discharge in the first case of excision of the malleus, was cured by the operation, and the subsequent free cleansing and drainage, in two months. The second case was benefited. The third case showed a similar result. The fourth case was cured in one month after the operation. The fifth case, with otorrhœa on *both* sides, was cured by the operation in both ears, for a month; then a return of otorrhœa ensued in both ears. This case being double otorrhœa, and operated on in both ears, furnished two excisions, and makes up the six mallei removed.

Caries of the Temporal Bone, followed by Penetration of Pus into the Cranial Cavity, and Collection of the same in the Lower Part of the Neck.

Prof. de Rossi, of Rome, has reported a case characterized by the above prominent symptoms (*Annales des Maladies de l' Oreille*, February, 1889). He maintains that when a purulent affection develops in the mastoid cavity, the pus tends to escape, not always in the direction of the least resistance. Its course is determined by the connective tissue, the bloodvessels, the lymphatics, and the nerves most accessible to the septic matters and the pyogenic microbes. Thus the broad and thick layer of connective tissue over the petro-squamous suture, explains in part the frequency of abscesses on the external wall of the mastoid, and the occasional necrosis in the bone at that point. Again, the numerous veinlets traversing the internal wall of the mastoid cavity form, with the connective tissue accompanying them, the best pathway for the pyogenic microbes into the transverse and sigmoid sinuses. This gives rise to a periphlebitis at these points, without perforation of the bone.

In the case presented by de Rossi to the Academy of Medicine in Rome, which formed the foundation of the paper before us, the pus which collected at the lower part of the neck could be forced out at the external auditory meatus, after following the nervo-vascular fasciæ, through the posterior foraamen lacerum, entering again the cranial cavity, where a subdural abscess had formed, and passing by a perforation in the sigmoid sinus, arrived at last in the mastoid antrum, and from there escaped into the tympanic cavity. "It is worthy of note that the membrana tympani remained intact from the processes of disease." Yet it must have been incised if pus escaped in this case from the external auditory meatus; as we are informed it did.

The conclusion of Prof. de Rossi is: "Given symptoms of an intra- or

extra-cranial abscess, with history of purulent inflammation of the middle ear, we must open the mastoid cavity and seek the pus, even as far as the sigmoid sinus."

Mastoiditis; its Course and the Results of Perforation of the Mastoid Apophysis.

Prof. Cozzolino, of Naples, has communicated his experience with mastoid inflammation and its results, based on observations in his aural clinic between November, 1883, and June, 1888 (*Annales des Maladies de l'Oreille* January, 1889).

Mastoid disease is nearly always consecutive to chronic purulent otitis media (rarely to acute otitis), and to osseous lesions in the auditory canal. Therapeutically considered, these affections are divided into three groups: 1. Treatment of lesions of the mastoid by trepanation, curetting the cavity, and by antiseptic lavage. Twenty-two such cases are tabulated, all consecutive to otitis media purulenta chronica. 2. Treatment of perimastoid affections by Wilde's incisions, and rigorous antiseptic measures applied to the middle ear cavities. Seventeen cases are tabulated, consecutive to chronic purulent otitis media. 3. Treatment of peri- and endo-mastoid lesions of a benignant type, at their outset, by careful antiseptic measures applied to the tympanic and mastoid cavities. These number seven, and were invariably consecutive to acute otitis media.

The following conclusions are given regarding the respective *rôles* of purulent infection and tuberculosis in the pathogenesis of mastoiditis:

1. The author has observed cases of endo-mastoiditis following chronic otitis media purulenta, manifesting all the symptoms attributed to tuberculosis of the temporal bone, yet in which the bacteriological examination gave results contrary to the diagnosis, and which demonstrated that the lesion was due to bacteria of suppuration, and not to those of tuberculosis.

2. Tuberculosis of the temporal, heretofore nearly abandoned to simply general treatment, is susceptible to treatment, as the author has demonstrated by means of curettage, aided by the most rigorous local antisepsis and rational treatment of the chronic inflammation of the middle ear and adjacent parts.

In the case of a child three years old, affected with scrofulo-tuberculous mastoiditis, among other tuberculous maladies, and in which the bacilli of Koch were found, Cozzolino obtained cicatrization in the osteo-periosteal structures by curettage, galvano-caustic, and antiseptic dressings of iodoform, corrosive sublimate, alcohol, and thymic acid.

His final general conclusions are: 1. Mastoid inflammation is always the result of chronic purulent otitis of the middle ear.

2. In all cases of mastoiditis, granulations and polypi are found in the middle ear cavities, which prevent the escape of pus from the tympanic cavity into the auditory canal. Sometimes there are small tumors found in the auditory canal, and also stenosis of this way of escape. It is the arrest of the escape of pus in these cases which is the cause of the diffusion of the inflammation from the tympanic cavity to the middle ear. In the pus thus detained in the mastoid, acids form, capable of exerting a corrosive chemical

action upon its osseous tissue. Hence the most rigorous antisepsis is demanded in these cases.

3. If there are no osseous lesions nor granulations in the middle ear, operation on the bone can be avoided by antiseptic treatment alone, and the mastoiditis thus cured. This will be the case in mastoiditis secondary to an acute otitis media.

4. Politzer's method of inflation is not competent to force pus into the mastoid cavity, and thus induce mastoiditis.

5. Trepanation is demanded when there is a new formation in the mastoid cells or some other osseous lesion, such as a sequestrum. It is not demanded always when there is present a simple caries, as both endo- and peri-mastoiditis accompanied by caries, recover under antiseptic treatment of the aural cavities. The simplest measures should be tried before having recourse to perforation of the mastoid.

6. In the diagnosis of meningeal and cephalic complications the surgeon should be guided by the ophthalmoscopic examination in addition to the ordinary symptoms in patients with suppuration in the ear, who suffer also with obstinate headache, nausea, and vomiting.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Mycosis in Healthy Subjects.

Dr. Otto Seifert, of Würzburg, refers (*Rev. de Lar.*, etc., March 1, 1889) to two cases reported by Freudenberg, and adds one of his own. A barber, thirty-six years of age, living in healthy quarters, had often had inflamed tonsils. For two days he had complained of pains in the neck as from an abscess. The last night they had been so intense, chiefly in the region of the larynx, that the patient could hardly swallow liquids. Examination revealed the uvula, the left side of the soft palate, and the left tonsil reddened; the uvula being œdematous. The border of the uvula was white and brilliant. Its posterior surface supported a series of white points distinctly situated upon a reddened base. Similar white points occupied the anterior surface of the anterior left palatine fold, principally at its inferior portion. The mucous membrane of the base of the tongue and of the epiglottis was strongly injected. The base of the tongue and the anterior surface of the epiglottis were likewise covered with the small patches elevated a little above the surface of the mucous membrane. Microscopic examination revealed granular detritus of epithelium and brilliant corpuscles representing the *oïdium albicans*.

The treatment consisted in the topical use of ice to relieve the pain in

deglutition, and in gargarisms of borax. The disease disappeared entirely in a few days. Its source could not be discovered.

Adenoid Vegetations in the Pharynx.

Dr. Krakauer, of Berlin, reviews (*Berliner klin. Woch.*, February 4, 1889) the various methods of removing these growths, and presents a new form of scraper which seems to be admirably adapted to its purpose. The blade of the instrument is curved backward upon the stem, and is convex from side to side, so as to avoid injuring the pharyngeal extremities of the Eustachian tube, the terminal convex edge alone being sharp. It is intended to be hooked into the anterior portions of the morbid growths and to scrape them off with a pull downward. The blade measures $\frac{1}{3}$ inch from side to side, and $\frac{1}{4}$ inch from front to back. The same instrument suffices for children and adults alike. In more than forty cases in which Dr. Krakauer has used it, only one or two tugs, and at most three, have sufficed to remove the entire mass of vegetations, which, in many instances, had acquired the volume of the phalanx of the thumb. It is claimed that the instrument will not shave off healthy mucous membrane.

While instruments of this scraping class enable large masses of adenoid growths to be removed rapidly, the fact should not be ignored that several serious and alarming accidents have occurred with them from the dropping of the removed or detached fragments into the larynx, and that at least one author has reported a fatal instance under his own hand. Instruments that bring away whatever is removed are far safer, even though the immediate results may be less brilliant in the majority of cases.

Intubation in Laryngeal Diphtheria.

Dr. Dillon Brown, of New York, gives (*N. Y. Med. Journal*, March 9, 1889) an analytical table of 200 patients operated upon by him, all but 1 of them in consultation practice, of whom 54, or 27 per cent., recovered. He also appends a combined table of 2368 cases with 647 recoveries, or 27.3 per cent. This shows that his own experience has furnished a very accurate representation of the efficacy of the procedure. This is the most valuable statistical record that has appeared. Dr. Dillon furnishes several tabular charts of his own cases, showing the relative numbers and proportions of deaths from various causes; the percentages of recoveries according to the duration of laryngeal symptoms before the operation became necessary; the percentages of recoveries according to similar duration of pharyngeal or post-nasal diphtheria; the percentages of recoveries according to age; and the percentages of recoveries for each month of the years 1885 to 1888.

His results indicate that those cases are the most favorable in which the progress of the stenosis is slow; that cases in which the membrane is absent from the pharynx or posterior nares are rather more fatal than those in which the membrane is present; that the death-rate is high in patients over eight years of age, because an unusually severe type of diphtheria is requisite to cause sufficient stenosis to need operative interference; and that variations in the results in different years are due in part to maturer experience in the

later years, but more so to variations in the type of the disease during the different winters. Of the last 115 cases operated on by Dr. Dillon, 50 were treated without bichloride of mercury, of whom 24 per cent. recovered; and 65 with it, of whom 36.9 per cent. recovered; thus convincing him of the value of that drug in the medicinal treatment of diphtheria.

Lipoma of the Larynx.

Dr. P. M'Bride (*Edinburgh Med. Journ.*, February, 1889) reports two cases of this rarity. In one instance a man had a pale pink rounded tumor, the size of a pigeon's egg, behind the tongue. It was attached to the epiglottis. About one-half was excised with scissors. The remainder was removed with the electro-caustic snare. It was found to be a fibro-lipoma. The stump had a broad attachment to the right vallecula and adjacent part of the dorsum linguæ. Recrudescence took place, and in five months it was as large as at first, and was again snared with the electro-caustic loop, and withdrawn as though it had been enucleated and not excised. In the other instance, a man seventy-one years of age, had a pale pink tumor, the size of a bantam's egg, overlying the left arytenoid cartilage. It was seized with a vulsellum, and excised with the electro-cautery snare. Its pedicle was narrow, and had been attached to the outer part of the right pyriform sinus. It had a distinct capsule.

These tumors, it will be seen, belong to the class of pharyngo-laryngeal and linguo-laryngeal growths, external to the larynx proper. All the reported cases, as far as the compiler's memory serves, have been extra-laryngeal save one recorded by von Bruns; and all with one exception have occurred in males. It would be interesting to investigate the histologic cause of apparent immunity for the sex.

Artificial Openings into the Larynx.

Dr. Furundarena-Labat, of Tolosa, reports (*Rev. Mens. de Lar.*, February, 1889) a satisfactory performance of intercrico-thyroid laryngotomy for encephaloid carcinoma of the larynx in a man sixty-seven years of age; the opening having permitted the introduction of a canula one-third inch in diameter. The skin and premembranous tissues were severed with a Paquelin thermo-cautery; the membrane with a bistoury. There was not the slightest effusion of blood.

On Curetting Laryngeal Growths.

Prof. F. Massei, of Naples (*Journ. Lar. and Rhin.*, February, 1889), refers to the recommendation of curettes, by von Bruns, in 1865, in his work on *Laryngoscopy and Laryngoscopic Surgery*, and to the plain, sharp spoons and the scissor-like scrapers used by Rossi, of Rome (*Lo Sperimentale*, February, 1887). He cites an instance in which Wroblewski successfully removed a large papilloma from the lower part of the epiglottis by a single curetting, after having performed tracheotomy. He then mentions the value of the curettes used by Heryng for scraping away tuberculous portions of the larynx, which he has used with success in removing papillomas both large

and small. Illustrations are presented of all these instruments. He concludes that curetting deserves better appreciation than it has received; that it is very serviceable in growths situated in the subglottic region and on the vocal bands or on their free edges; that it removes portions of the tissue from which the growths have originated, and permits more direct treatment afterward with local agents, of which lactic acid is the most preferable, and thus gives greater security against recurrence.

Carcinoma of Larynx.

An instance of auto-inoculation of the right vocal band, limited at first to a point at which it was impinged upon by an ulcerating carcinoma of the left vocal band, has been described by Dr. Newman (*Lancet*, January 19, 1889), at a meeting of the Clinical Society of London.

An instance of exfoliation of the greater part of the laryngeal cartilages in a case of carcinoma, was reported at the same meeting by Semon (*idem.*). The patient was a man fifty-two years of age. The disease had begun in hoarseness, April, 1886; dyspnœa had supervened later, and tracheotomy had been performed September, 1887. When first seen by Semon, January, 1888, the laryngeal appearances were entirely those of perichondritis, but there was typical carcinoma externally below the tracheotomy tube. Hemorrhages from the tube became more and more frequent, with expectorations of fragments of gangrenous muscles, and subsequently of cartilage. On one occasion a large part of the cricoid plate, and on another almost one-half of the thyroid were expelled. Death took place by exhaustion July 27, 1888. At the post-mortem the larynx was found changed into an enormous cavity, 6.5 cm. in length, the walls of which were ulcerated throughout. Only the greater part of the left half of the cricoid and the left arytenoid cartilage were found, the remainder of the laryngeal cartilages having been destroyed or eliminated. The trachea was healthy. There was no perforation of the œsophagus. There was right-sided purulent pleurisy. The right lung was consolidated, and contained numerous gangrenous cavities.

Laryngectomy for Carcinoma.

Dr. M. Schede, of Hamburg, reports (*Deut. med. Woch.*, January 24, 1889) a case of complete recovery of more than four years' standing. A woman, fifty-six years of age, had an extensive carcinoma, for the eradication of which, on June 24, 1884, Schede extirpated the entire larynx, the cricoid cartilage, and the upper ring of the trachea. As recently exhibited to the Arztlichen Verein of Hamburg, she was presented as a healthy woman attending to an extensive business, and providing for a household in which thirty persons sit at table daily. She had not been hampered a day in her avocations since October 10, 1884, at which time a recurrent carcinoma had been extirpated from the right upper margin of her pharyngeal fistula. She occludes the pharyngeal portion of her tube with an obturator when eating; and, as witnessed by the members of the society, swallows water without any difficulty. She also wears the obturator at night, which prevents her from being disturbed by tricklings of saliva through it. She wears an aluminium ball valve when

she speaks. She is happy in her work and in no wise embarrassed in any of her functions. In fact, she endures no more than any one does who suffers with chronic hoarseness. Her condition, therefore, is the very opposite of being utterly miserable.

SCHECH also reported two other cases of complete laryngectomy, which ran a good course at first, but in which death ensued subsequently by recurrence.

LONG SOJOURN OF A FOREIGN BODY IN THE TRACHEA.

PROF. E. LEYDEN (*Deut. med. Woch.*, Jan. 31, 1889) exhibited to the Society for Internal Medicine a fragment of flat, shap-pointed calf bone, two centimetres long and one centimetre broad, which had remained in the air-passage, trachea most probably, of a young lady for eight and a half months, and which was finally expectorated after having produced an almost continuous and distressing cough which had resisted most varied medication and climatic treatment to which she had been subjected. The chief clinical point in the case was the absence of hoarseness throughout, and the absence of any evidence of impairment in the general health. We note that a probable diagnostic feature that had been attributed to irritation at the bifurcation of the trachea, had been present in a continuous pain beneath the sternum. In the discussion of the subject (*Idem.* Jan. 24) several instances were narrated of the long sojourn of foreign bodies in the air-passages, some of them without producing any impairment of health.

A FLEXIBLE CANULA FOR THE OBSTRUCTED TRACHEA.

DR. A. GOUGUENHEIM, of Paris, reports (*New York Med. Journal*, March 9, 1889, illustrated) a case of tracheotomy for carcinoma of the larynx in which great dyspnœa ensued subsequently, in consequence of the development, at the site of the wound, of a tumor which increased to the size of an orange and pushed the canula very much out of place, so that it became too short to be of proper service. Gouguenheim had a silver canula constructed, with its terminal two-thirds formed of a continuous spiral, the rings of which are attached to each other so that this lower portion should be movable. It has answered its purpose admirably. Furthermore, it always remains *in situ* when the strings which fasten it around the neck are loosened. Illustrations are given of the canula, and of its aspect in position.

ERYSIPELAS OF THE NASAL PASSAGES.

DR. SCHIFFLERS, of Liége, reports (*Rev. de Lar.*, etc., March 1, 1889) two cases of intranasal erysipelas consecutive to erysipelas of the face. They were successfully treated by irrigation two or three times a day with a solution of corrosive sublimate 1 : 4000, and the continued use of intranasal tampons of sublimated cotton.

OBSTETRICS.

UNDER THE CHARGE OF

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Version in Contracted Pelves.

Nagel (*Archiv für Gynäkologie*, Band 34, Heft 1) reviews the literature of this subject, and reports 59 cases of version and extraction, which he compares with 20 cases of forceps delivery in contracted pelves. His conclusions favor version and extraction as a mode of treatment; and are based upon the following practical considerations:

The varieties of contracted pelves most commonly encountered are the symmetrically contracted (justo minor), the flat pelvis, and the flat-rachitic pelvis. Nagel is convinced that podalic version is equally indicated in these pelves. He considers the measurement of the diagonal conjugate of little practical value, and measures the true conjugate only; the shortest true conjugate in his cases measured three and one-eighth inches. His record is 60 versions in contracted pelves, without a maternal death; 61 children were delivered, 46 of whom lived.

Version should be performed *early;* mortality and morbidity increase with the duration of labor. The obstetrician must not delay until the os is fully dilated, but should perform version as soon as the hand can be introduced and the breech brought into the cervix, when uterine contractions generally dilate the os sufficiently to permit birth. So long as the membranes have not ruptured, the case should be left to nature, but in transverse positions, when the membranes rupture, version should be performed at once; extraction should follow as soon as the os is sufficiently dilated. Nagel considers the use of forceps after version unjustifiable. In cases where children had been lost in previous labors, version lessened greatly fœtal mortality. Nagel found no malposition of the head a contra-indication to version. He performed version in all grades of pelvic contraction, as it affords the fœtus a chance for life, and perforation of the after-coming head has been no more difficult than when the head presents, in his experience, when craniotomy becomes necessary.

In delivering these cases Nagel relies chiefly upon external pressure upon the head through the abominal walls; traction should not be made upon the trunk until flexion is well established. At the moment when the head emerges undue haste is to be avoided, as children may survive after a delay of five or ten minutes.

Nagel closes by urging the critical importance of the early stages of labor for the choice of a mode of treatment. In primiparæ, with contracted pelves, when the membranes have not ruptured and the head does not enter the pelvis, version should be performed as soon as the os is dilated; if the head partially enters the pelvis, or inclines to enter, the complete dilatation of the

os should not be awaited. In multiparæ, who have had previous successful labors, further delay is justifiable, with the hope that labor will proceed spontaneously.

He appends the report of 20 cases of labor in contracted pelves, terminated by forceps; maternal mortality, 20 per cent.; morbidity, 50 per cent.: fœtal mortality, 15 per cent.; morbidity, 20 per cent. The smallest true conjugate in which forceps was used measured 3.7 inches.

Retention of the Placenta from Contraction of the Lower Uterine Segment.

Freund (*Zeitschrift für Geburtshülfe und Gynäkologie*, Band 16, Heft 1) reports seven cases of retention of the placenta through contraction of the lower uterine segment immediately after delivery. He draws especial attention to three of these cases, in which congenital or acquired anteflexion of the uterus was the cause. In many cases of anteflexion, when pregnancy occurs, abortion results from the unyieldingness of the uterine walls, which do not dilate as the ovum grows. After labor such uteri contract promptly, and resume the condition of anteflexion.

In cases where the obstetrician is aware of congenital anteflexion before pregnancy, every precaution should be taken during labor to avoid irritating the lower uterine segment; the bladder and rectum should be emptied regularly, and ergot avoided. After the expulsion of the child the uterus should not be rubbed or pressed upon; no traction should be made on the cord, and small doses of narcotics may be given.

If contraction occurs, and the placenta is retained, bleeding should be checked by the tampon. If no bleeding is present, the patient should be left in absolute quiet, frequent antiseptic vaginal douches given, and narcotics and abdominal fomentations used. Chloroform is often efficient in bringing about relaxation. Forcible dilatation should rarely be resorted to; if the placenta and uterus become septic they should be extirpated together. In one case, reported by Freund, the placenta was expelled spontaneously fourteen days after labor, the patient recovering without complications.

Acute Meningitis during Pregnancy.

Chambrelent (*Annales de Gynécologie*, February, 1889) reports seven cases of acute meningitis during pregnancy, some of them tubercular. In six cases labor was terminated artificially with the birth of a living child. In one case birth was spontaneous, before the death of the mother. Microscopic examination of the fœtal tissues, with inoculation experiments upon animals, failed to reveal tuberculosis transmitted from the mother to the fœtus.

The practical deduction from these cases is, that labor should be invariably induced in meningitis during pregnancy whether tubercular or not, as early as seven months. The prognosis for the mother is almost hopeless.

Severe Post-partum Hemorrhage Fifteen Days after Delivery.

Labusquière (*Annales de Gynécologie*, February, 1889), reports a case of severe hemorrhage fifteen days after labor, supposed to have been normal.

The os and cervix were so tightly contracted that exploration of the uterus was impossible. The continuous use of the tampon, ergot, and ether hypodermatically, and quinine and stimulants, resulted in the spontaneous expulsion, after four days, of a placental cotyledon, which had decomposed and was extremely offensive. A very foul discharge had persisted in spite of intra-uterine injections of bichloride of mercury 1 to 1000, with moderate fever. The patient speedily recovered after the expulsion of the fragment of placenta.

Extra-uterine Pregnancy, with Ovarian Cyst.

Edis (*Medical Press*, February 27, 1889) reports a case of cyst of the right ovary, with tubal pregnancy, which ruptured with fatal result. A diagnosis of the extra-uterine gestation was made very early in the case, but operation was deferred until rupture produced urgent symptoms, by the decision of a consultation. Operation was performed, but too late, the patient dying from shock following hemorrhage into the broad ligament.

Extra-uterine Pregnancy, with the Expulsion of the Fœtus per Rectum.

Morisani (*Wiener klinische Wochenschrift*, No. 7, 1889) reports the case of a multipara, who presented herself at his clinic in Naples, with the history of cessation of menstruation; persistent slight hemorrhage, with periodic pain in the abdomen and on the perineum. For a time fœtal movements and many of the usual symptoms of uterine gestation existed. After an attack of severe abdominal pain followed by hemorrhage and urgent desire to empty the rectum, fœtal movements ceased. A recurrence of these symptoms led the patient to go to stool, where she passed blood and sero-mucoid fluid; she attempted manually to remove the offending substance from the rectum, and grasped the leg of a fœtus.

On admission to the hospital, she was extremely prostrated. A fœtus, about nine inches long, was removed from the rectum; the fœtal cyst was thoroughly cleansed and disinfected, and a large drainage tube inserted. Under a strictly antiseptic and stimulating treatment the patient recovered, the rectal opening gradually cicatrized as the sac became obliterated, and she left the hospital before Morisani had an opportunity to close the small rectal opening remaining.

Tubal pregnancy, with rupture and discharge of the ovum into Douglas's cul-de-sac, had existed, with final discharge of the fœtus per rectum. The fœtal appendages had necrosed and been discharged in the same manner.

Hernia of the Pregnant Uterus.

Adams (*American Journal of Obstetrics*, March, 1889) has collected 23 cases of hernia of the pregnant uterus, of which 10 were inguinal; 1 crural; 1 sacro-sciatic; 4 umbilical, and 8 ventral. The maternal mortality was 25 per cent.; fœtal mortality 14 per cent. Diagnosis was made early in inguinal and crural; after the eighth month in umbilical; after the fifth month in ventral hernia. 6 cases of inguinal hernia were treated by Cæsarean section

1 by Porro's operation; in 1 case delivery was spontaneous; premature labor was induced in 1. The case of crural hernia was treated by Cæsarean section, the child being saved. The cases of umbilical hernia were successfully treated by supporting the uterus twice; by forceps in one case; labor occurred once spontaneously. Ventral hernia was successfully managed by supporting the uterus in four cases; two cases terminated spontaneously. In some cases the method of treatment and result could not be ascertained.

In general, reposition of the uterus should be attempted as early as possible, care being taken to avoid abortion or premature labor. If the uterus cannot be replaced, it should be supported by a broad bandage, and pregnancy should go on to viability. A truss will generally retain a uterus which can be replaced. If the fœtus can pass through the hernial ring, labor should be induced at viability. When the fœtus cannot pass through the natural exit, Cæsarean section should be performed.

Recent Literature on the Cæsarean Section.

Sänger (*Centralblatt für Gynäkologie*, No. 8, 1889), in a discussion at Leipzig, defines his method of operating to be an efficient closing of the uterine wound by abundant stitches which unite the uterine muscle, without leaving a stitch-fistula into the uterus; over this closure of the peritoneum, bringing its surfaces together by a double row of stitches, using an antiseptic suture material which will not suppurate and loosen. The various modifications of Sänger's method have added nothing to its efficiency.

Leopold (*Archiv für Gynäkologie*, Band 34, Heft 2) has added eight recent Cæsarean sections to his record, which now aggregates thirty-one. Of his recent operations seven were done for contracted pelvis, and one for eclampsia. He employs the elastic ligature about the cervix, passing it once around, and drawing it just tight enough to prevent hemorrhage; he considers it indispensable. Stringent antisepsis is practised; the vagina and cervix are carefully douched and filled with iodoform gauze.

Leopold does not incise the uterus *in situ*, but turns it out of the wound, and when the fœtal heart-sounds are weak and irregular, does not wait to insert stitches in the abdominal wound, but has the abdomen closed by the assistant's hands, while he quickly incises the uterus and extracts the child The greatest dexterity and expedition are needed to rescue feeble children in these cases. His material for deep sutures is chromicized catgut; for superficial, fine silk. He has modified his former indications for operation to include cases where fœtal heart-sounds suddenly fail. Among his recent cases was one of acute gonorrhœa; the vagina and cervix were carefully disinfected and filled with iodoform gauze; mother and child recovered.

His results in twenty-five cases of conservative Cæsarean section are, maternal mortality eight per cent., fœtal mortality nil. In comparing craniotomy and Cæsarean section, he estimates maternal mortality after craniotomy to be nil; he believes that Cæsarean section is at least five times more fatal for the mother than craniotomy, and is to be performed when the mother willingly assumes the risk of the operation.

In this connection he quotes Carl Braun's results at Vienna by other methods. 51 cases of contracted pelvis delivered by craniotomy, mortality

1.95 per cent.; Braun also reports 163 spontaneous births in contracted pelves, with no mortality; 54 cases of induced labor, no mortality; 89 versions, no mortality; and 78 atypical forceps deliveries in contracted pelves, mortality 1.29 per cent.

Braun (of Krakau) (*ibid.*) reports a Cæsarean section for neuroma, with fatal result, before the modern operation. A Porro operation for contracted pelvis (conjugata vera two and one-third inches) followed, with success. A Sänger operation for contracted pelvis was successful; two post-mortem sections were also made, one for rupture of the uterus, one for meningitis and pulmonary œdema; in the latter the child was delivered alive.

GYNECOLOGY.

UNDER THE CHARGE OF

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The Treatment of Pyosalpinx by Puncture through the Vagina.

Rochet (*Province Médicale*, December 15, 1888) reviews the different varieties of salpingitis, adopting a classification which will not commend itself to pathologists. The only interest in the paper centres in the paragraph on treatment, in which he alludes to the views expressed by Laroyenne regarding the palliative treatment of pyosalpinx. "A large number of gynecologists," says the author, "try a less radical, or, at least, a less dangerous treatment (than laparotomy), and one which is, moreover, rational since it consists in the evacuation of the purulent collection." Since many diseased tubes are so buried in adhesions as to be non-removable without great danger of rupture, the writer agrees with Laroyenne that it is preferable in such cases to puncture through the vagina, to enlarge the opening, and to wash out the sac, as in a case of ordinary pelvic abscess. This treatment should not be adopted to the exclusion of radical operations in proper cases.

[We have quoted from this paper in order to express our disapproval of the views advanced. They will be accepted by few, if any, experienced laparotomists, since they imply a radical misconception of the difference between pyosalpinx and pelvic abscess proper. The latter is an abscess pure and simple, a "circumscribed collection of pus;" the former is an entirely different condition, both etiologically and clinically. No one denies that a true pelvic abscess may be cured by incision and drainage per vaginam, but he is a timid surgeon who would adopt such treatment in a well-recognized case of pyosalpinx. It would seem unnecessary to dispute this point at all if it were not for the occasional expression of such views as those which we have quoted. If generally applied, we must regard them as mischievous, and opposed to good surgery.—Ed.]

Thure Brandt's Method as an Aid to the Diagnosis of Salpingitis.

Winauer's article on this subject (*Centralblatt für Gynäkologie*, December 29, 1888) is quite suggestive, although his observations were unfortunately not confirmed by laparotomy or autopsy. Referring to the difficulty which is experienced in distinguishing at the examining table a dilated tube when buried in a mass of exudation, he calls attention to the ease with which the diseased tube or ovary may be mapped out after the adhesions have been stretched by a course of pelvic massage, according to the method practised by Brandt. In four patients who were thus treated (the *séances* varying from four to sixteen) the obscure mass felt at the first examination was so cleared up that it was possible to trace the enlarged tube throughout its extent, and to define its relation to the cornu uteri. After prolonged treatment the abdominal wall became relaxed, the adhesions distensible, and the original tenderness so much diminished that it was possible to make a perfectly satisfactory diagnosis without administering an anæsthetic. Of course, the presence of subacute inflammation is a contra-indication to pelvic massage, although it is not always so regarded.

Brandt is credited by Theilhaber (*Münchener med. Wochenschrift*, 1888, No. 28) with venturing to attempt the emptying of a distended tube into the uterus by "rolling it gently between the fingers of both hands," a manœuvre which it is admitted often causes an "escape of secretion into the peritoneal cavity, which readily gives rise to transient symptoms of peritonitis"(!).

Hysterorrhaphy.

Leopold reported at a recent meeting of the Dresden Gynecological Society (*Centralblatt für Gynäkologie*, March 10, 1889) nine cases of ventro-fixation of the uterus, some of which were successful at the expiration of two years. He advises the operation only in exceptional cases, where the ordinary treatment (including the practice of Schultze's method) was unsuccessful. He introduces several silk sutures through the entire thickness of the abdominal wall, and to the depth of three millimetres into the muscular tissue of the fundus uteri, and removes them at the end of fourteen or sixteen days.

In the discussion following Bode objected to the performance of laparotomy for the correction of the displacement alone. He had in many instances succeeded in loosening the adhesions by Schultze's method. In cases of retroflexion with fixation, in which he had performed laparotomy for other reasons, he was accustomed to separate the adhesions and, after anteverting the uterus, to retain it in its normal position by shortening the round ligaments. He had performed hysterorrhaphy three times, but the patients all had more pain than after an ordinary laparotomy, and in every instance developed mural abscesses at the site of the uterine sutures.

Schramm preferred Thure Brandt's method, but did not think that the adherent uterus could always be detached by pelvic massage. He had performed ventro-fixation in six cases with good results; the uterus remained permanently in a position of anteversion, although the patients were subject to constant physical strain.

Leopold, in conclusion, agreed that Schultze's method was useful in many cases, but not in those which he had selected for operation. When both the uterus and adnexa were firmly adherent it was rarely successful. He did not believe that the shortened round ligaments would sustain the uterus permanently, as they would stretch in time.

Salpingotomy for Hæmatosalpinx due to Atresia of the Vagina.

Fuld (*Archiv für Gynäkologie*, Bd. xxxiv. 2d part, 1889) in an elaborate article, based upon a successful case of laparotomy for the relief of this condition, analyzes sixty-five cases, forty-eight of which terminated fatally. Thirty-nine patients were operated upon, seventeen being cured. Among the different methods of treatment Kaltenbach recommends puncture per vaginam, especially when rupture seems imminent, several cases having been thus treated with success. Hausmann approves of puncture through the abdominal wall, but no successful cases have been recorded; the same is true of puncture per rectum as practised by Brown. Removal of the hæmatosalpinx is most popular, Schröder having performed the first operation. Breisky and most other surgeons advise emptying the uterus before resorting to laparotomy. The author agrees with them, and recommends that, if the tubal sac does not become smaller as soon as the hæmatometra has been evacuated, the abdomen should be opened. Laparotomy should also be performed promptly if the sac disappears suddenly after emptying the uterus (provided that there is not a characteristic discharge of inspissated blood from the tube), as it is probable that the tube has burst and that its contents have escaped into the peritoneal cavity.

A Contribution to the Literature of Massage of the Uterus and Adnexa.

Koplik (*Amer. Journ. of Obstetrics*, February, 1889) contributes an interesting paper on this subject, in which he presents in a very condensed form, his experience with Brandt's method of pelvic massage, and calls attention to the dangers incurred. These are: Hemorrhage, rupture of bands, expression of pus from the tube into the peritoneal cavity, and rupture of small follicular cysts of the ovary or encapsulated collections of pus. A case is cited in which hæmatoma followed a *séance*. Sudden pain during massage of the ovaries, which disappears after a few days, is probably due to rupture of a peripheral cyst. There is always more or less risk in manipulating the tubes, even when they are not apparently diseased; so that it is better not to massage them.

Suppurative Disease of the Uterine Appendages.

Boldt (*Ibid.*, March, 1889) is more conservative in his views than most of the recent writers on this subject. He divides cases of tubal disease into three classes—those in which operative interference is unjustifiable, those in which the patient should be kept under constant palliative treatment, and a third, in which an operation should be performed without delay. Pyosalpinx is a condition calling for prompt interference, since the patient is always in imminent danger of rupture; hydro- and hæmatosalpinx should also be removed,

provided that the tube is occluded at the uterine end, a fact which can be determined by gently squeezing it from the distal toward the proximal end, and noting if its contents are evacuated. Even in cases of pyosalpinx it may be advisable to delay operative interference if the pus can be evacuated into the uterine cavity by employing Brandt's method. The latter claims to be able to cure such cases, but the writer has very rarely been able to demonstrate this condition before opening the abdomen. When the tube is only moderately distended, is non-fluctuating, and gives rise to few, if any, symptoms one should delay operation, since it is possible that the pus has become cheesy and is then in no danger of escaping into the peritoneal cavity. A distended tube should not be aspirated per vaginam unless the operator is sure that it is so encapsulated that the pus cannot make its way into the peritoneal cavity after withdrawal of the aspirating-needle.

In conclusion the writer adds the caution that, while Brandt's method may be valuable as an aid to the diagnosis of patency of a tube, it is dangerous in the hands of the inexperienced.

Open Fallopian Tubes; their Diagnosis, Pathology, and Treatment.

Wallace contributes to the *British Medical Journal*, February 23, 1889, a short but suggestive paper on this subject, based upon observations made in fifty-three cases. He inclines to the belief that patency of the tubes is a normal (?) post-partum condition, due to subinvolution of these ducts, and referable to the same causes as subinvolution of the uterus. Relaxation of the uterus may also account for non-closure of the ostium uterinum. He dismisses as absurd the old idea that the lumen of the tube becomes larger during menstruation, in order to allow the passage of the ovum. It may happen that only one tube is patent during pregnancy, the ostium uterinum of the other being covered by the placenta.

Certain symptoms are mentioned as accompanying patency of the tubes, although they are not clearly defined. In exploring the pelvic cavity in a typical case the mucous membrane of the vulva and vagina is congested, red, and livid, and this is intensified on the shortened, swollen, and œdematous cervix uteri, which fills the calibre of the largest speculum. The os is patulous, eroded, and is filled with a plug of ropy mucus. The uterus is large and retroverted, and the ovaries and tubes are usually felt behind it. A blunt-pointed sound, if introduced up to either cornu can, with a little manipulation, easily be slipped into the open tube and may be passed up to the hilt, when the tip will be felt through the abdominal wall. The patient experiences no pain or subsequent discomfort. No force should be used, the sound being held between the thumb and finger.

The prognosis of these cases is rather doubtful. The treatment consists in hot vaginal douches, replacement and support of the uterus, and weekly catheterization of the tubes. No intra-uterine injections should be given. When the probe after being introduced is "grasped by a firmly contracting uterus," the surgeon may infer that the organ is recovering its tone and that the tubes will soon close.

[This paper is somewhat confusing, by reason of the fact that while the

writer states that the condition described probably exists normally after parturition, he assigns to it a distinct symptomatology and a line of treatment which to most gynecologists must appear somewhat heroic. Conservative readers will hardly favor the addition of a new affection to the already long list of tubal diseases.—Ed.]

The Subsequent Condition of the Ovaries and Tubes after Extirpation of the Uterus.

Grammatikati, as the result of a series of experiments upon rabbits, arrives at the following conclusions:

1. The ovaries continue to be functionally active after extirpation of the uterus. The ovisacs continue to ripen, the ova to be discharged, and corpora lutea to be formed as before.

2. If both the uterus and the tubes are removed the ovaries still remain active.

With reference to the disturbances which may arise from this persistence of ovarian activity, the writer calls attention to the difference noted according as the patient is young or at the menopause. In the former case she may have after hysterectomy various indefinite pains in the abdomen and reflex phenomena, especially nausea, dyspnœa, neuralgia, etc. These symptoms sometimes show a certain periodicity in their recurrence corresponding to the menstrual nisus. The practical deduction is to remove the ovaries with the uterus.

Persistent Menstruation due to Remains of Ovarian Stroma.

At a recent meeting of the British Gynecological Society (*British Gynecological Journal*, February, 1889) Dr. Heywood Smith referred to the importance of removing the entire ovary and tube when performing salpingo-oöphorectomy, since he believed that the recurrence of the monthly flow might be due to the leaving behind of a small portion of the ovarian stroma.

In the discussion which followed, Dr. Bantock stated that he did not accept this explanation of the phenomenon, since he could recall several cases in which menstruation persisted after complete removal of the ovaries. Mr. Tait ridiculed the idea that a small fragment of an ovary could produce this result any more than a bit of kidney could go on secreting urine after the rest of the organ had been excised. Menstruation was not at all dependent upon the ovaries; in one of his cases it persisted after the uterus and appendages had been removed.

Puncture per Vaginam in Cases of Abscess of the Ovary.

A statement by Dr. Routh (*Ibid.*) with regard to the palliative treatment of this condition provoked an interesting discussion, in which Mr. Tait protested strongly against puncture per vaginam. It was impossible, he said, to "cure even a simple parovarian cyst by tapping; it was sure to refill and require removal." *Apropos* of pelvic abscesses, he expressed the opinion that "a parametric abscess was about the rarest pelvic condition there was." Any tumor which bulged into Douglas's pouch could not lie within the broad liga-

ment, but must be intraperitoneal. An exudation in the left broad ligament would be felt as a ring nearly surrounding the rectum; one in the right would be detected along the brim of the pelvis. The entire differential diagnosis of pelvic tumors was based upon these facts.

Electricity in Gynecology.

Recent papers on this subject by Dr. Steavonson and Dr. Shaw, read before the London Obstetrical Society (*Transactions* for June and July, 1888), provoked a somewhat heated discussion, in which Dr. Playfair enthusiastically upheld the value of Apostoli's method of treatment, which he thought was destined to limit considerably the field of abdominal surgery. Dr. Bantock expressed marked scepticism with regard to the brilliant results claimed by Apostoli in treating fibrous tumors of the uterus. He said that he had never yet seen a case in which such a tumor was caused to disappear by the use of the constant current, although this had actually occurred after removal of the tubes and ovaries, as he could testify. The consensus of opinion was not flattering to the electrical treatment.

MEDICAL JURISPRUDENCE.

UNDER THE CHARGE OF

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The Second Test of Live-birth.

Nikitin, of Moscow, gives this title to a paper on the value of the presence of air in the stomach and intestines of a newly born infant, tested by the ability of these organs to float in water, as a proof of the child having been born alive, and places this test next in importance to the hydrostatic lung test (*Viertelj. f. gerichtl. Med.*, N. F., Bd. xlix. pp. 44–63 et 282–303). His experience is derived from the post-mortem examination of one hundred newborn children in the University and of twenty-four children in the Foundling Hospital of Moscow.

His conclusions are:

(1) The gastro-intestinal test not only supports the lung test, but it is even able in some cases, in which the lung test is negative, to afford evidence by itself of live-birth. (2) If in the fresh corpse of a newborn child, the stomach, and especially if also the intestines contain air, and float in water, it may with certainty be concluded that the child survived birth; provided air was not artificially introduced into the stomach, as by inflation. (3) If the body is well advanced in putrefaction, the gastro-intestinal test is less reliable than the lung test; but if the body is only moderately putrefied, the former test is as trustworthy as the latter. (4) A negative result from the gastro-intestinal test is not proof of the child having been stillborn, no more

than is a negative result from the lung test; but if such a result is obtained from the application of *both* tests in fresh, but especially in putrid, bodies, then it may be inferred that the child was stillborn, unless in rare cases in which signs exist of sudden death by violence applied immediately after birth. (5) If the stomach and a portion of the intestines are well filled with air and the corpse is fresh, it may certainly be concluded that the child did not die immediately after birth—excepting always cases of artificial inflation. (6) The first bubbles of air reach the newborn child's stomach by swallowing. (7) The possibility of "atelectasis secundaria neonatorum"—that is, of the complete disappearance of air from the lungs of a newborn child—is highly probable.

Sudden Death in Infants from Enlarged Thymus.

Prof. Grawitz, of Greifswald (*Deutsch. med. Wochenschr.*, No. 22, 1888), gives the details of two cases of sudden death in newborn infants caused by suffocation from enlarged thymus

In one of the cases, the thymus was so large as to cover the greater part of the heart, its length being 3 inches, and its greatest breadth 2.4 inches. Its average thickness was about 0.6 inch, but immediately behind the manubrium of the sternum it measured 0.72 inch. The color of the gland was grayish-red, with numerous bright red petechiæ on the surface. The consistence was tolerably firm. The heart was large and well developed, and covered with a number of petechiæ. The gullet showed marked signs of lateral compression, its mucous membrane, as also that of the pharynx, being reddened. The inner surface of the larynx and trachea was also considerably reddened, but especially at the bifurcation of the latter, which corresponded to the seat of greatest compression between the top of the sternum and the spinal column. The larger bronchi contained a clear reddish froth. The lungs were moderately collapsed, but all the vesicles contained air. The spleen was large and bluish-red. All other organs normal. Both infants were quite well up till the appearance of suffocation.

Traumatic Injuries of the Spleen in their Medico-legal Aspects.

In the *Vierteljahrschrift f. gerichtl. Med.*, N. F., Bd. 1. S. 180, January, 1889, a summary is given of an exhaustive monograph in Russian on this subject, by Dr. E. F. Bellien, of Charkow, the monograph being based on four hundred cases collected from medical literature and on a considerable number of cases which occurred in the experience of the author. The following are his conclusions:

(1) Traumatic rupture of the spleen, as an immediate cause of death from violence applied to the spleen directly or indirectly from without, the walls of the belly and chest being uninjured, is observed only in pathological conditions of the spleen. (2) The rupture is often accompanied by hæmatoma of the spleen, from hemorrhage into a lacerated part of the organ. (3) The hæmatoma may consist of two or three separate hemorrhages, or be spread throughout the substance of the spleen. (4) The hæmatoma may precede the rupture of the splenic capsule in cases of repeated violence; and the rupture of the capsule may even result from the bursting of the hæmatoma. (5) The

origin of the hæmatoma on the one hand, and of the rupture on the other, may consist in injuries received at different times, and not simultaneously; (6) Traumatic hæmatoma, accompanied by rupture are of pathognomonic importance in establishing the violent nature of the death. (7) Microscopic examination of the contents of the traumatic hæmatoma often affords evidence of the length of its existence, and of the possible successive hemorrhages. (8) Primary traumatic rupture of the spleen with laceration of the capsule, uncomplicated with injury to the chest and abdominal wall, always indicates death from internal hemorrhage (never from peritonitis). (9) Traumatic rupture of the normal, non-pathological spleen, with absence of injury to the abdominal wall, is met with only in cases of fracture of the ribs. (10) In cases of rupture of the spleen, without visible injury to the covering of the chest or abdomen, ecchymoses and suggillations are very often met with under the costal pleura, and are to be regarded as affording important evidence of violence having been applied.

Vulvo-rectal Fistula from Coitus.

Springsfeld, of Bonn, describes the case of a woman, aged thirty-six, who on the night following her marriage, experienced intense pain in the first coitus, followed by much bleeding, and next day by the passage of flatus and feces from the vulva. After some months, each coitus being still more or less painful and the passage of feces still continuing, she sought the advice of Springsfeld, who found a recto-vaginal fistula, with smooth edges, in the position of the fossa navicularis, and capable of admitting two fingers. All the other parts of the genital organs were of normal appearance and size. The fistula was closed by operation. This is now the fifth reported case of this kind in medical literature. Springsfeld believes that in the case reported by him the occurrence of the fistula was favored by a probably very narrow and rigid vagina, and by the thinness of the partition between the fossa navicularis and the rectum.— *Vierteljr. f. gerichtl. Med.*, N. F., Bd. l. S. 70–76, Jan. 1889.

Case of Obstetric Malapraxis.

A report of such a case is given in the *Vierteljahrschr. f. gerichtl. Med.*, N. F., Bd. l. S. 8–13, January, 1889), in which a German practitioner, Dr. V., of H., was found guilty of malapraxis.

The facts of the case are briefly as follows: Mrs. K. was attended at the commencement of her confinement by a midwife, who, believing the presentation of the child to be of the nature of a "cross-birth," sent for Dr. V., who came at once, and apparently confirmed the midwife's diagnosis, but administered a dose of ergot, and left the patient for six and a half hours. At the end of this time he was again summoned by the midwife, who was now certain of its being a cross-presentation. Dr. V. now proceeded to effect the delivery, and very soon brought down an arm of the child, but could do nothing more without instrumental aid. He, therefore, applied the forceps with vigor, but still failed to deliver the infant. He finally attempted to deliver by pulling at the child's arm, but again failed. Another physician, Dr. C., was now sent for by the husband of the patient, who, however, refused to come until Dr. V. had

retired from the case, which the latter did. Dr. C. then arrived, and found a cross-presentation, and the woman complaining of much pain, other than of normal parturition, in the hypogastrium. She was also suffering from dyspnœa and vomiting. No signs of excessive hemorrhages from the genitals. Dr. C. at once turned the child, and delivered it with ease. But in introducing his hand into the vagina, he felt a cord-like piece of tissue pressing against his wrist, whose presence he could not explain. The subsequent stages of the labor were completed successfully. The woman, however, complained of violent pain in the left side of the abdomen; and, twenty-four hours later, a distinct swelling could be felt there. Forty-eight hours after the birth the woman died, with symptoms of abdominal inflammation, but without rise of temperature. At the autopsy, it was ascertained that the peritoneal cavity contained some ounces of dark, partly fluid, partly coagulated, blood; omentum slightly inflamed; uterus reddish-brown, and much swollen; a large tear at the inner edge of the vagina, toward the left side and front, measuring five inches long, and one to two inches broad, the edges of the tear being uneven, jagged, and reddened.

The conclusions arrived at by the experts who made the autopsy, was that Mrs. K. had died from injury to the genital organs, and that this injury could have been produced in the unskilful attempts of Dr. V. to deliver the woman. The *Medicinal Collegium* approved of the above conclusion, and characterized the treatment of Dr. V. as being throughout unskilful: (1) in administering ergot in a case of cross-presentation; (2) in endeavoring to deliver the child by pulling at its arm, and (3) by the use of forceps; and (4) in making no attempt to turn the child.

The Detection of Blood-stains which have been Exposed to a High Temperature.

At the suggestion of Prof. Liman, of Berlin, Katayama has carried out in Salkowski's laboratory, a long series of experiments for the purpose of determining the effect of different degrees of heat on blood-stains, in interfering with their detection (*Viertlj. f. gerichtl. Med.*, N. F., Bd. xlix. pp. 269–281). Liman was led to suggest the investigation owing to his having at one time experienced difficulty in detecting blood in blood-stains on a coat which had been ironed. Katayama's method consisted in exposing blood-stains for one hour, each to a different degree of temperature, varying from 60° (140° F.) to 180° C. (356° F.), and afterward testing the solubility of the blood in various menstrua, viz.: Distilled water, saturated solution of borax, concentrated solution of potassium cyanide, solution of ammonia, dilute solution of caustic soda (one part solution of sp. gr. 1.017 + three parts of water), acidulated alcohol (twenty parts absolute alcohol + one part dilute sulphuric acid), and glacial acetic acid. The depth of color of the solution was noted, and its spectra determined.

The results of the investigation may be thus summarized: (1) A temperature of 100° C. (212° F.), or under, did not greatly interfere with the solubility of the blood in all the solvents. (2) A temperature of 120° C. (248° F.) rendered the blood insoluble in water and solution of borax, but left it slightly soluble in cyanide solution; still more soluble in ammonia and

acidulated alcohol; and most soluble of all in soda solution and acetic acid. (3) A temperature of 140° C. (284° F.) to 180° C. (356° F.) so altered the blood that it ceased to be soluble in cyanide solution, as well as in water and borax solution; but it was still slightly soluble in ammonia and acidulated alcohol, and fairly soluble in soda solution and acetic acid. (4) The best solvents for heated blood-stains are, therefore, the last two named. (5) In the case of stains exposed to the higher temperatures, the only spectrum which the investigator can rely on obtaining, is that of reduced hæmatin or hæmochromogen. (6) Crystals of hæmatin may be obtained by the usual method from all stains heated to 120° C. (248° F.), from but two-thirds of those heated to 140° C. (284° F.), and from none heated to 160° (320° F.) or higher.

Arsenical Wine.

Dr. Marquez, of Hyères, has communicated an account of the wholesale poisoning by arsenical wine at Hyères, to the Société de Médecine Légale (*Annal. d'hyg. publ.*, sér. 3, t. xxi. pp. 74–77, January, 1889), from which it appears that, in the beginning of 1888, over 400 persons exhibited symptoms of a peculiar illness in Hyères and its neighborhood. Some were slightly affected, others more severely. In the former, the symptoms consisted chiefly of disturbances of the digestive organs, pain in the throat, a threatening of coryza, and lassitude. In the latter, the gastro-intestinal symptoms were greatly accentuated, and were sometimes accompanied by fever, vomiting, usually with a little diarrhœa or colic, preceded by dyspnœa and general catarrhal discharges, resembling the symptoms of a true influenza. Pains and cramps were also felt in the limbs, especially in the feet, less frequently in the hands, accompanied sometimes by contractions of the fingers and toes. Bronzing of the skin was also observed, and erythema followed by peeling of the epidermis, with or without ephidrosis, paralytic phenomena, hyperæsthetic or anæsthetic paresis, akinesia, amaurosis, anaphrodisia, metrorrhagia, etc.

The wine of the district was, after a while, suspected as the cause, and was examined, without any injurious ingredient, such as lead, or impure fuchsine, being discovered. The further progress of the illness, however, showed that it was distinctly to be associated with the wine from a particular vineyard, and a more careful analysis of it revealed the presence of arsenic to the extent of six centigrammes per litre (about one-half grain per pint). Inquiry at the vineyard elicited the fact that by accident a barrel of white arsenic, stored for seven or eight years, for the treatment of some vine disease, had been mistaken for a barrel of material of like appearance used in making wine. Dr. Marquez urges greater care in the sale and use of white arsenic.

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"He visited Baltimore for medical aid, and was for many months under the treatment of some of the most eminent men of the profession in that city, but without beneficial result, and was finally advised that he had nothing to hope from remedies.

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